

TK50 Tape Drive Subsystem

Owner's Manual

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Contents

RUN THE USER TEST (TAPE).....	1-22
Inserting the Tape Cartridge	1-22
Removing the Tape Cartridge.....	1-22
PREPARE YOUR OPERATING SYSTEM.....	1-24

Chapter 2 Operation

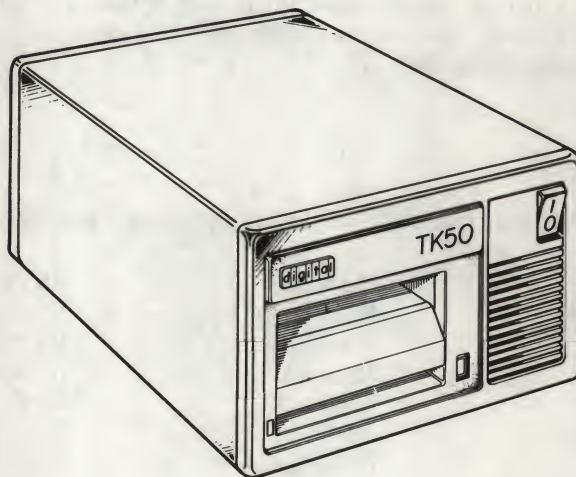
INTRODUCTION	2-1
FRONT PANEL.....	2-2
REAR PANEL	2-4
TK50-D, -R TAPE DRIVE.....	2-5
LABELING A TK50 TAPE CARTRIDGE.....	2-6
WRITE-PROTECTING A TAPE CARTRIDGE	2-6
CARE AND HANDLING OF TK50 TAPE DRIVE AND TK50 TAPES	2-7
BACKING UP FILES ON A TK50 TAPE CARTRIDGE	2-7
INSERTING A TK50 TAPE CARTRIDGE.....	2-8
REMOVING A TK50 TAPE CARTRIDGE.....	2-10

Chapter 3 Technical Description

INTRODUCTION	3-1
PHYSICAL FEATURES	3-2
TK50 Subsystem.....	3-3
TQK50-KA (M7546) Controller Module	3-3
OPERATING FEATURES.....	3-5
ENVIRONMENTAL REQUIREMENTS.....	3-5
POWER SUPPLY	3-5
DC COOLING FAN	3-5
FRONT PANEL CONTROLS AND INDICATORS.....	3-6
REAR PANEL	3-8
UNIT NUMBER DESIGNATION	3-8
CONFIGURATION	3-9
CONFIGURATION RULES.....	3-9
Module Physical Priority	3-9
Backplane and I/O Distribution Panel.....	3-10
Power Requirements	3-10
Interrupt Vectors/Module Starting Addresses	3-13
UNIT NUMBER DIP SWITCH	3-17
SYSTEM CONTROLLER AND CABLE OPTIONS	3-19
MicroPDP-11 AND MicroVAX CONFIGURATION	3-20
PDP-11/23 PLUS CONFIGURATION.....	3-22

TK50 Tape Drive Subsystem

Owner's Manual



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VAX
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VT
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Contents

Introduction

Chapter 1 Installation

INTRODUCTION.....	1-1
UNPACK THE TK50-R (RACK MOUNT) SUBSYSTEM.....	1-2
INSTALL THE TK50-R TAPE DRIVE AND FRONT COVER.....	1-3
UNPACK THE TK50-D (DESKTOP) SUBSYSTEM.....	1-4
PARTS NEEDED TO PREPARE YOUR COMPUTER (Figure 1-4)	1-5
REMOVE THE REAR COVER AND CABLES.....	1-6
REMOVE THE I/O DISTRIBUTION PANEL.....	1-7
REMOVE ALL MODULES FOLLOWING THE CPU AND MEMORY MODULE(S) FROM THE BACKPLANE.....	1-8
PREPARE THE FIRST TK50 CONTROLLER MODULE (M7546)	1-9
INSTALL THE TK50 CONTROLLER MODULE (M7546).....	1-10
RUN THE CONTROLLER LED QUICK-TEST.....	1-12
INSTALL THE TK50 CONTROLLER CABLE IN THE I/O DISTRIBUTION PANEL.....	1-13
INSTALL ALL OTHER MODULES IN THE BACKPLANE	1-14
CONNECT THE TK50 CONTROLLER CABLE	1-15
INSTALL THE I/O DISTRIBUTION PANEL AND ALL CABLES.....	1-16
REMOVE THE REAR COVER AND POWER CABLE (Figure 1-15)	1-17
CONNECTING A TK50 SUBSYSTEM.....	1-18
IDENTIFY THE POWER CABLE AND CHECK THE VOLTAGE SWITCH... ..	1-19
CONNECT THE POWER CABLE TO THE TK50 SUBSYSTEM AND THE WALL OUTLET	1-20
REPLACE THE REAR COVER.....	1-20
SET THE POWER SWITCH OF THE TK50 SUBSYSTEM TO 1 (ON)	
THEN SET THE POWER SWITCH OF THE COMPUTER TO 1 (ON).....	1-20
RUN THE USER TEST (DISKETTE).....	1-21

RUN THE USER TEST (TAPE).....	1-22
Inserting the Tape Cartridge	1-22
Removing the Tape Cartridge.....	1-22
PREPARE YOUR OPERATING SYSTEM.....	1-24

Chapter 2 Operation

INTRODUCTION	2-1
FRONT PANEL.....	2-2
REAR PANEL	2-4
TK50-D, -R TAPE DRIVE	2-5
LABELING A TK50 TAPE CARTRIDGE.....	2-6
WRITE-PROTECTING A TAPE CARTRIDGE	2-6
CARE AND HANDLING OF TK50 TAPE DRIVE AND TK50 TAPES	2-7
BACKING UP FILES ON A TK50 TAPE CARTRIDGE	2-7
INSERTING A TK50 TAPE CARTRIDGE.....	2-8
REMOVING A TK50 TAPE CARTRIDGE.....	2-10

Chapter 3 Technical Description

INTRODUCTION	3-1
PHYSICAL FEATURES	3-2
TK50 Subsystem.....	3-3
TQK50-KA (M7546) Controller Module	3-3
OPERATING FEATURES.....	3-5
ENVIRONMENTAL REQUIREMENTS.....	3-5
POWER SUPPLY	3-5
DC COOLING FAN	3-5
FRONT PANEL CONTROLS AND INDICATORS.....	3-6
REAR PANEL	3-8
UNIT NUMBER DESIGNATION	3-8
CONFIGURATION	3-9
CONFIGURATION RULES.....	3-9
Module Physical Priority	3-9
Backplane and I/O Distribution Panel.....	3-10
Power Requirements.....	3-10
Interrupt Vectors/Module Starting Addresses	3-13
UNIT NUMBER DIP SWITCH	3-17
SYSTEM CONTROLLER AND CABLE OPTIONS	3-19
MicroPDP-11 AND MicroVAX CONFIGURATION	3-20
PDP-11/23 PLUS CONFIGURATION.....	3-22

Chapter 4 Troubleshooting

INTRODUCTION	4-1
TROUBLESHOOTING TABLES.....	4-2
TK50 EXTENDED TESTING WITH MicroPDP-11 SYSTEMS.....	4-4
CZTKA User Interface.....	4-5
Hardware Questions.....	4-5
Software Questions.....	4-6
CZTKA Message Format	4-6
Format 1.....	4-6
Format 2.....	4-7
Level 2 Microdiagnostics Test Descriptions	4-8
Test 1 - Simple Write/Read Test	4-8
Test 2 - Streaming Write/Read Test.....	4-8
Test 3 - Thrashing Write/Read Test.....	4-8
Test 4 - Peak Shift Test.....	4-9
Test 5 - Signal Sag Test.....	4-9
Test 6 - Overwrite Test.....	4-9
Test 7 - Track Access Test.....	4-9
Test 8 - Positioning Test.....	4-9
CZTKB Data Reliability Test.....	4-10
CZTKB Program Operation.....	4-10
Hardware Questions.....	4-10
Software Questions.....	4-11
CZTKB Error Reporting	4-12
Commands.....	4-12
Status, Log Packet, and Program Errors	4-12
Drive Errors	4-13
Hard Error Reports	4-14
Soft Error Reports.....	4-15
CZTKB Data Reliability Test Description.....	4-15
Test 1 - Basic Function Test.....	4-15
Test 2 - Quick Verify Write/Read Test.....	4-15
Test 3 - Complex Write/Read Test	4-16
Test 4 - Write Interchange Tape.....	4-16
Test 5 - Read Unknown Tape	4-16
TK50 EXTENDED TESTING WITH MicroVAX II SYSTEMS.....	4-17
Functional Diagnostics Message Format.....	4-17

Contents

Pass/Fail Criteria.....	4-18
Soft Errors.....	4-18
Hard Errors	4-18
Device Fatal Errors	4-18
Functional Diagnostic Test Descriptions/Verify Mode.....	4-18
Test 1 - Existence Verification Test	4-18
Test 2 - Level 1 Testing (Power-Up Diagnostics).....	4-18
Test 3 - Diagnostic Wrap Test	4-19
Test 4 - Initialization Test	4-19
Test 5 - Vector and BR Level Test.....	4-19
Test 6 - Purge and Poll Test.....	4-19
Test 7 - Small Ring Buffer Init Test	4-20
Test 8 - Maximum Ring Buffer Test.....	4-20
Test 9 - Get DUST Status Test	4-20
Test 10 - DUP Server Functionality Verification.....	4-20
Functional Diagnostic Test/Service Mode Tests.....	4-21
Test 1 - Q-Bus Exerciser and RAM Test	4-21
Test 2 - Execute Level 2 Microdiagnostics.....	4-21
Level 2 Microdiagnostic Test Descriptions.....	4-21
Test 1 - Simple Write/Read Test	4-21
Test 2 - Streaming Write/Read Test.....	4-21
Test 3 - Thrashing Write/Read Test	4-22
Test 4 - Peak Shift Test.....	4-22
Test 5 - Signal Sag Test.....	4-22
Test 6 - Overwrite Test	4-22
Test 7 - Track Access Test.....	4-22
Test 8 - Positioning Test.....	4-22
REMOVAL AND REPLACEMENT PROCEDURES.....	4-23
TK50 Tape Drive Removal.....	4-24
Power Supply Removal.....	4-29
Fan Assembly Removal.....	4-30

Appendices

- Appendix A Connector Pin Numbers and Signals
- Appendix B System Specifications
- Appendix C Related Documentation
- Appendix D Service Options

FIGURES

1-1	TK50-R System and Parts	1-2
1-2	Installing a TK50-R Tape Drive in a Rack Mount Assembly.....	1-3
1-3	TK50-D System and Parts	1-4
1-4	Items Needed to Prepare the Computer	1-5
1-5	Remove the Rear Cover and All Cables.....	1-6
1-6	Remove the I/O Distribution Panel	1-7
1-7	Removing Modules	1-8
1-8	M7546 Jumpers and Switches	1-9
1-9	Install the TK50 Controller Module (M7546).....	1-10
1-10	Location of M7546 LEDs.....	1-12
1-11	Installing the Filter Connector	1-13
1-12	Installing Modules.....	1-14
1-13	Connecting the TK50 Controller Cable to the TK50 Controller Module.....	1-15
1-14	Installing the I/O Distribution Panel and Cables	1-16
1-15	Remove Rear Cover and Power Cable	1-17
1-16	Connecting a TK50 Subsystem	1-18
1-17	Identify the Power Cable and Check the Voltage Switch.....	1-19
1-18	User Test Diskette.....	1-21
1-19	Loading a TK50 Tape Drive	1-23
1-20	Software Instructions	1-24
2-1	TK50 Controls and Indicators	2-2
2-2	Rear Panel Assembly.....	2-4
2-3	Inserting a Tape Cartridge.....	2-5
2-4	Labeling and Write-Protecting a TK50 Tape Cartridge.....	2-6
2-5	Inserting and Removing a Tape Cartridge.....	2-9
3-1	Desktop and Rack Mount Subsystems.....	3-2
3-2	M7546 Module	3-4
3-3	TK50 Controls and Indicators	3-6
3-4	Rear Panel.....	3-8
3-5	Backplane and I/O Distribution Panel Arrangements	3-10
3-6	BA23-A Configuration Worksheet	3-11

Contents

3-7	Jumper Pack Settings	3-15
3-8	Unit Number DIP Switch Settings	3-17
3-9	Revision Level Switch Settings	3-18
3-10	One TK50 Subsystem with a BA23 Enclosure.....	3-20
3-11	One TK50 Subsystem with One RD5n Subsystem with a BA23 Enclosure	3-21
3-12	H349 Distribution Panel.....	3-22
3-13	One TK50 Subsystem Add-On for a PDP-11/23 PLUS System.....	3-23
3-14	Two TK50 Subsystems with a PDP-11/23 PLUS System	3-24
4-1	Removal from Rack Mount Housing.....	4-24
4-2	Removal from Desktop Housing.....	4-25
4-3	Sliding the Tape Drive Forward.....	4-26
4-4	Remove the Power Cable and Drive Cables.....	4-27
4-5	TK50-D, -R Subsystem Groove and Channel Guide.....	4-28
4-6	Power Supply, Component Side View.....	4-29

TABLES

1-1	Order of Modules in the BA23 Backplane.....	1-11
1-2	M7546 Microdiagnostic LEDs.....	1-12
2-1	TK50 Subsystem Controls.....	2-3
2-2	TK50 Subsystem Indicator Lights.....	2-3
3-1	Current and Power Requirement Limits	3-11
3-2	Power Requirements, Bus Loads, I/O Distribution Panel.....	3-12
3-3	M7546 Fixed CSR Address.....	3-13
3-4	Address/Vector Worksheet.....	3-14
3-5	Floating CSR Address Chart	3-15
3-6	Unit Number Switch Pack Settings.....	3-17
3-7	Revision Level Switch Pack.....	3-18
3-8	System Controller and Cable Option Kits.....	3-19
4-1	Basic Troubleshooting Checklist.....	4-2
4-2	Error Printout Commands	4-12
4-3	Sample Messages and Their Source.....	4-12
4-4	Data Reliability Test Status Drive Errors.....	4-13
4-5	TK50 Subsystem FRUs.....	4-23
4-6	TQK50 Cabinet Kit Part Numbers and Descriptions	4-23
A-1	Connector Signals.....	A-1
A-2	AC Power Supply Input Connectors	A-2
A-3	DC Power Supply Output Connectors	A-2
B-1	General Environmental Requirements.....	B-1
C-1	The TK50 Subsystem Library.....	C-1

Introduction

You can use your free-standing TK50-D (desktop) or TK50-R (rack mount) subsystems as an add-on to MicroPDP-11, MicroVAX, PDP-11/23 PLUS, and other Q-Bus systems. You can easily attach the subsystems to an existing system or incorporate them in new designs.

These subsystems operate with the TK50 controller module (M7546) installed in the host computer.

NOTES, CAUTIONS, WARNINGS

Notes, cautions, and warnings in this manual are defined as follows.

- NOTE – contains general information.
- CAUTION – contains information to prevent damage to equipment
- WARNING – contains information to prevent personal injury

TK50-D, -R TAPE DRIVE, WHAT YOU NEED TO KNOW

Your TK50 tape drive subsystem is a delicate precision instrument and subject to damage if handled improperly. It will give you good, reliable service if you observe the following precautions.

- Follow instructions carefully when installing your TK50 tape drive subsystem.
- Do not drop or bump the tape drive.
- Pack your tape drive in its original packing material when transporting or shipping your subsystem to prevent damage from shocks and vibrations.
- Do NOT place foreign objects inside drive.
- Always remove the cartridge before powering-down and/or moving the drive.

INTENDED READERS

This book provides reference material for the owner (Chapter 2) as well as technical information for service personnel (Chapters 3 and 4). Refer to your software documentation for information on how to use the subsystem with your system.

NOTE

Chapter 1 contains installation instructions for service representatives or the owner. Read the following information BEFORE you attempt to install your TK50 subsystem.

If a TK50 controller module is already installed in the computer, you can attach the TK50-R or TK50-D subsystem.

If a TK50 controller module needs to be installed, make sure the installation is done by a trained service representative.

WARNING

Dangerous voltages can exist within the system. Do not access the inside of either the subsystem or your computer unless you are a trained service representative.

Chapter 1, Installation, contains two sets of instructions.

- Set 1 – FOR FIELD SERVICE REPRESENTATIVE ONLY
 - Provides instructions for installing the TK50 controller module in MicroPDP-11 and MicroVAX systems and for attaching a TK50-R or TK50-D subsystem.
 - Start with Step 1 and continue to the end of the installation procedure.

CAUTION

Static electricity can damage modules installed in the system and in mass storage devices. Always use a grounded wrist strap and grounded work surface (Velostat kit order number 29-11762-00) when accessing any internal part of the computer or handle modules.

- Set 2 – FOR OWNER or FIELD SERVICE REPRESENTATIVE
 - Provides instructions for attaching an external TK50-D, -R tape drive to a MicroPDP-11 or MicroVAX system that already has a TK50 controller module installed.
 - For a TK50-R (rack mount) subsystem, start with Steps 2 and 3, then go to Step 14 to complete the installation.
 - For a TK50-D (desktop) subsystem, start with Step 4, then go to Step 14 to complete the installation.

The illustrations in this chapter show the MicroPDP-11 and MicroVAX systems. The procedure to prepare other Q22-Bus systems and install an external TK50 tape drive is identical. Chapter 3 provides additional material specific to the PDP-11/23 PLUS system.

HELP

If you need help:

- Refer to Chapter 4, Troubleshooting.
- For hardware questions, call your service representative.
- For software questions, call your sales representative and ask for an access code number for the Digital Phone Support Center (PSC).

REFERENCES

References made throughout this book refer to specific chapters of your system's owner's or technical manuals. These references apply only to systems with KDJ11-B or 630QA modules. If your system differs, or if you have a PDP-11/23 PLUS system, refer to the table of contents or index of your system's documentation to locate the information.

ACRONYMS USED IN THIS BOOK

The following exceptions are not included in this list.

- Signal names
- Acronyms displayed in messages
- Acronyms used by diagnostic programs

BLK	Block
BOT	Beginning of tape
CB	Circuit breaker
CONFIG	Configure; refers to software program
CPU	Central processing unit
CSR	Control status register
DIP	Dual in-line process; refers to switches
DMA	Direct memory access
DRV	Drive
DRV SEL	Drive select
DSA	Digital storage architecture

DMSCP	Disk mass storage protocol
DUP	Diagnostics utilities protocol
EOT	End of tape
ERR	Error
FRU	Field replaceable unit
I/O	Input/output
IDR	Inhibit drop units
IP	Initialize polling; refers to a register
LED	Light emitting diode
LEOT	Logical end of tape
LOE	Loop-on-error
MFM	Modified frequency modulation
MSCP	Mass storage control protocol
PP	Purge and poll
RAM	Random access memory
REG	Register
ROM	Read-only memory
SA	Starting address
SYSGEN	System generation; refers to software program
TMSCP	Tape mass storage control protocol
TYP	Type
UQSSP	U/Q-Bus storage system protocol
VOLT SEL	Voltage select; usually refers to a switch
WR	Wrap; refers to a bit

Installation 1

INTRODUCTION

Place the TK50-D, -R tape drive subsystem where it is to be used.

- Allow space around the unit for air circulation and servicing.
- Place the unit away from heaters, photocopiers, and direct sunlight.
- Minimize static by placing the unit away from busy office corridors.
- Keep the unit away from magnets and equipment that generate magnetic fields, such as motors, transformers, and terminals.
- Keep the area free from dust and other abrasive materials.

If a TK50 controller module is already installed in the computer, you can attach the TK50-R or TK50-D subsystem.

If a TK50 controller module needs to be installed, make sure the installation is done by a trained service representative.

To install a TK50-R tape drive, start with Steps 1 and 2, then follow the directions at the bottom of the page.

To install a TK50-D tape drive, start with Step 3, then follow the directions at the bottom of the page.

1 UNPACK THE TK50-R (RACK MOUNT) SUBSYSTEM

If any item is missing or damaged:

- Contact your sales representative.
- Contact your delivery agent.

Prepare the H9302 rack mount kit, which is shipped separately. Refer to documentation provided with the kit for instructions (Figure 1-1).

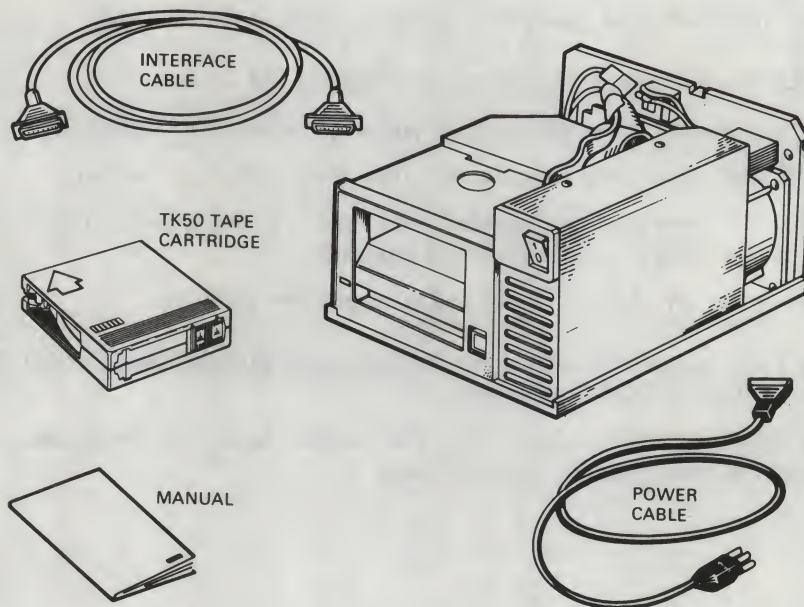


Figure 1-1 TK50-R System and Parts

The TK50-R tape drive is shipped completely assembled and ready to install in an H9302 rack mount assembly.

2 INSTALL THE TK50-R TAPE DRIVE AND FRONT COVER

The front cover is provided with the H9302 rack mount kit (Figure 1-2).

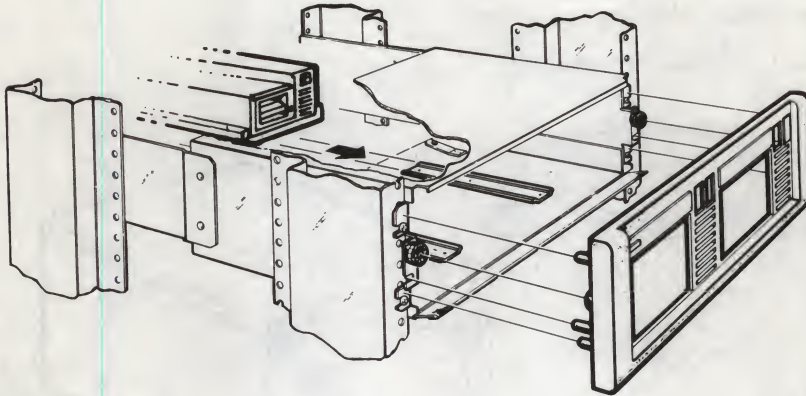


Figure 1-2 Installing a TK50-R Tape Drive in a Rack Mount Assembly

If you are installing a TK50 controller module, go to Step 4.

If your computer already contains a TK50 controller module, go to Step 15.

3 UNPACK THE TK50-D (DESKTOP) SUBSYSTEM

If any item is missing or damaged (Figure 1-3):

- Contact your sales representative.
- Contact your delivery agent.

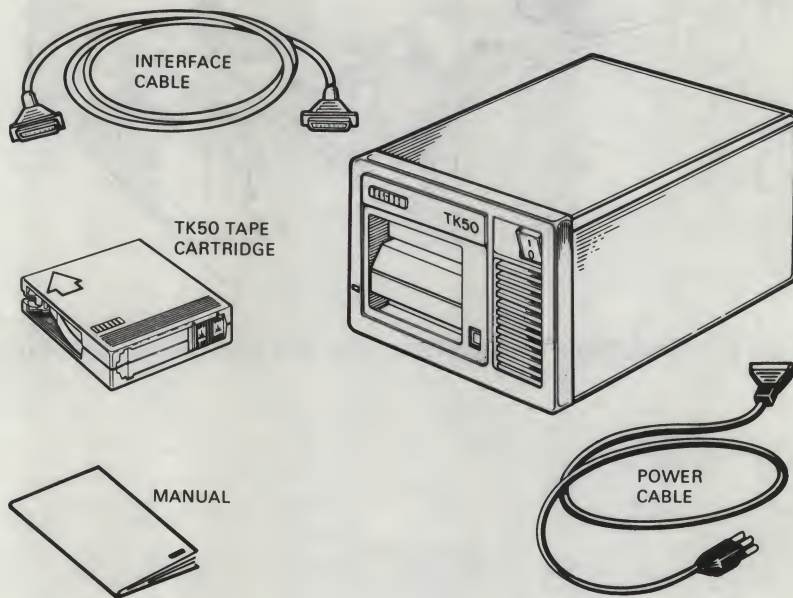


Figure 1-3 TK50-D System and Parts

The TK50-D tape drive is shipped completely assembled and ready to connect to the computer system.

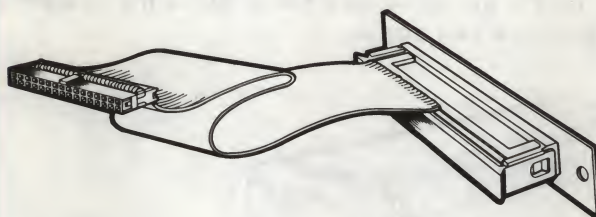
If you are installing a TK50 controller module, go to Step 4.

If your computer already contains a TK50 controller module, go to Step 15.

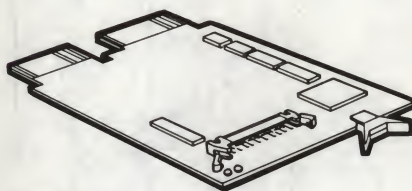
4 PARTS NEEDED TO PREPARE YOUR COMPUTER (Figure 1-4)

WARNING

Only qualified service representatives should perform the following procedures that access the inside of the system. Dangerous voltages can exist within the system.



TK50 CONTROLLER
CABLE



M7546
TK50 CONTROLLER
MODULE

CAUTION:
STATIC ELECTRICITY
CAN DAMAGE YOUR
MODULE

Figure 1-4 Items Needed to Prepare the Computer

5 REMOVE THE REAR COVER AND CABLES

- Set the power switch to 0 (off).
- Remove the rear cover (Figure 1-5).

NOTE

If desired, lift the system onto a table. Since the system weighs 32 kg (70 lbs), use two people.

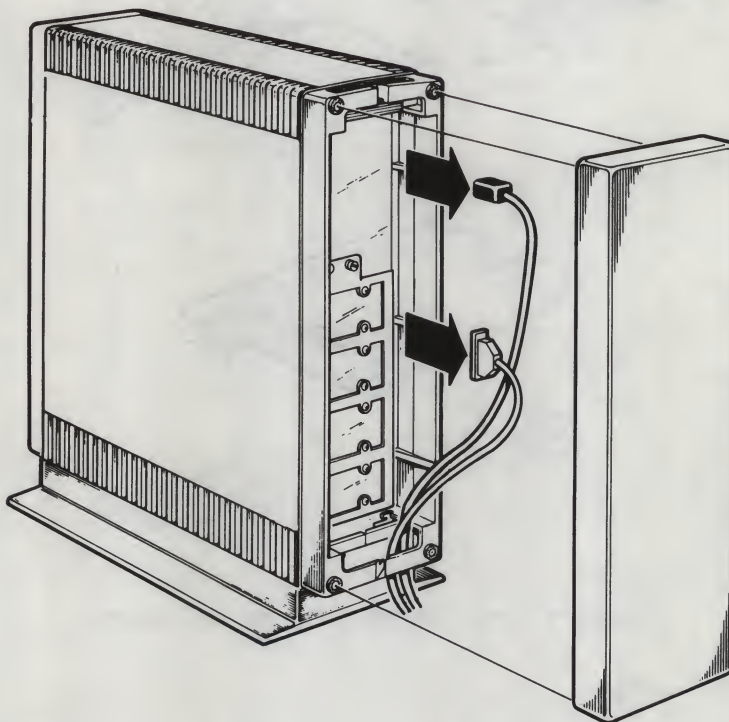


Figure 1-5 Remove the Rear Cover and All Cables

6 REMOVE THE I/O DISTRIBUTION PANEL

- Remove the I/O distribution panel (Figure 1-6).
- Detach the ground straps and all ribbon cables.

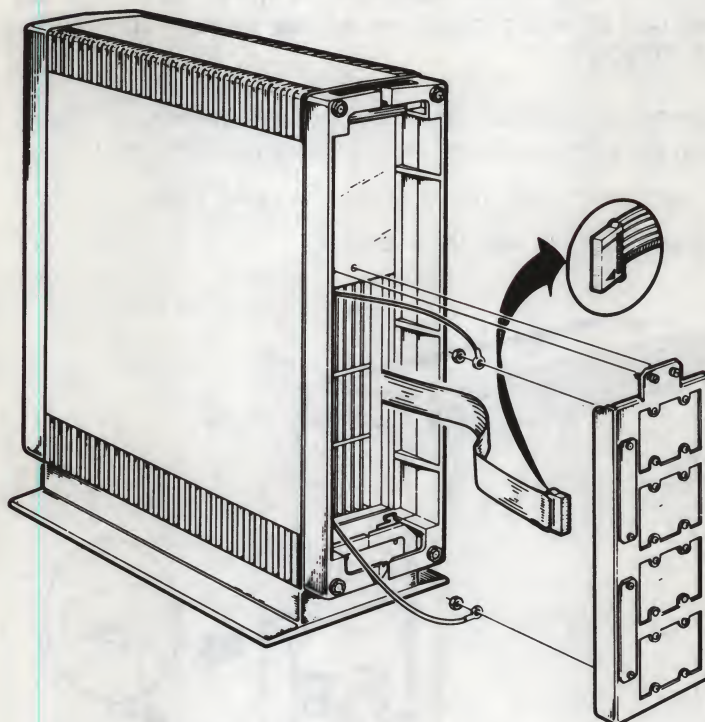


Figure 1-6 Remove the I/O Distribution Panel

7 REMOVE ALL MODULES FOLLOWING THE CPU AND MEMORY MODULE(S) FROM THE BACKPLANE

CAUTION

Static electricity can damage modules. Always use a grounded wrist strap and grounded work surface when you access any internal part of your computer or handle modules (Digital Part No. 29-11762-00).

- Note the order in which you remove the modules. The module number is stamped on the visible portion of the installed module (Figure 1-7).
- Note the orientation of any red stripes on the ribbon cables.
- Pull the levers back and slide the board out.

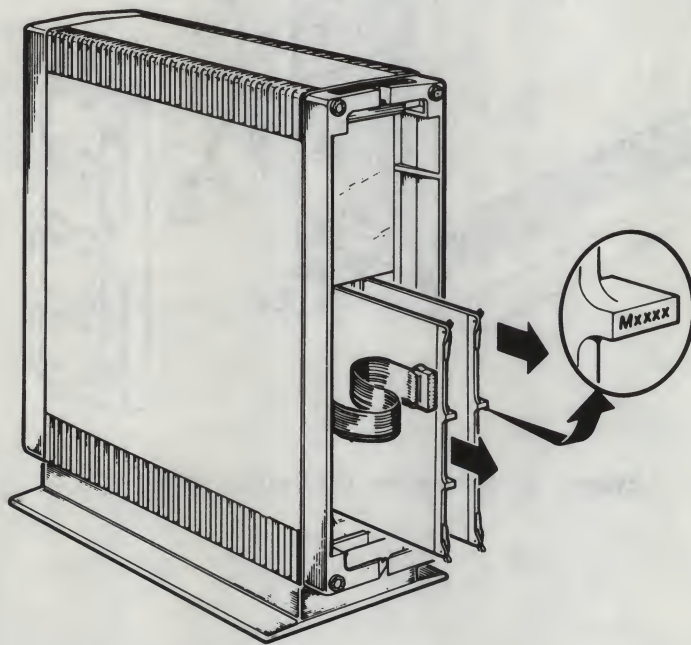


Figure 1-7 Removing Modules

Refer to Chapter 3, Table 3-2 for CPU and memory module identification.

8 PREPARE THE FIRST TK50 CONTROLLER MODULE (M7546)

- Make sure the address jumpers are set as shown (Figure 1-8).
- Make sure the unit number dual in-line process (DIP) switch is set as shown.
- Make sure the revision level DIP switch matches the revision level of your module; see the back of the module for this number.

If you install any additional tape drives, the address jumpers and unit number DIP switch must be changed. See Chapter 3, Technical Description, for configuring additional M7546 controller modules.

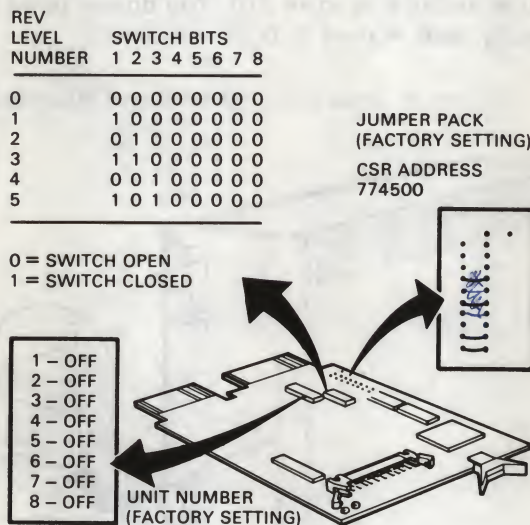


Figure 1-8 M7546 Jumpers and Switches

PDP: unit sw 8 = on

9 INSTALL THE TK50 CONTROLLER MODULE (M7546)

- Use Table 1-1 to determine the proper backplane slot to install the M7546 module.
- Install any other modules that must precede the M7546 module.
- Install the module in rows A/B or C/D. A grant continuity card (G7272 or M9047) or any other dual-height module must be installed in the unoccupied row (Figure 1-9).

NOTE

If you install a M7546 module in any of the first three slots of the backplane, install it in rows A/B. You do not need to install a grant continuity card in rows C/D.

Refer to Chapter 3, Technical Description, for additional information.

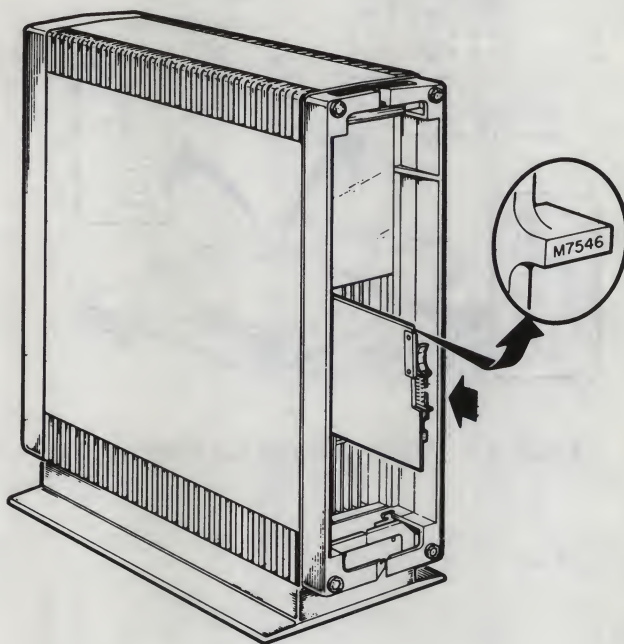


Figure 1-9 Install the TK50 Controller Module (M7546)

Table 1-1 Order of Modules in the BA23 Backplane

Order	Type of Device	Option	Module	Comments
1	Communications	DEQNA	M7504	Ethernet
		DPV11	M8020	Synchronous
		DRV11-J	M8049	General purpose; no silos
		DRV11-B	M7950	
2	Line printer	LPV11	M8027	
3	Communications	DLVE1	M8017	Asynchronous; silos
		DLVJ1	M8043	Asynchronous; no silos
		DZV11	M7957	Asynchronous; with silos
		DHV11	M3104	Asynchronous; with silos
		DMV11-M	M8053	Synchronous; DMA
		DMV11-N	M8064	Synchronous; DMA
		DUV11	M7951	Bisynchronous
4	Tape controller	TQK25	M7605	
		TQK50	M7546	
5	Disk controller	KLESI	M7740	
		RLV12	M8061	
6	MSCP controller	RQDX1	M8639	Last occupied slot
		RQDX2	M8639-YB	

10 RUN THE CONTROLLER LED QUICK-TEST

- Plug in the system power cable.

WARNING

Do not touch the rear of the system while it is plugged into the ac voltage source. Shock could result from exposed voltages inside the system.

- Set the power switch to 1 (ON) and observe the light emitting diodes (LEDs). If the conditions shown in Table 1-2 are not met, the M7546 module is defective and must be replaced (Figure 1-10).
- Set the power switch to 0 (OFF) and remove the system power cable.

Table 1-2 M7546 Microdiagnostic LEDs

LED	Location	Condition	Description
Level 1	Left	Blink ON (red) then OFF	The module is installed and working properly.
TMSCP INIT	Right	ON (red)	This LED remains lit. The host initialization cannot be completed until the TK50 subsystem is fully installed.

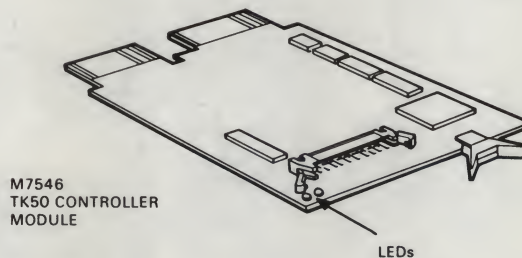


Figure 1-10 Location of M7546 LEDs

11 INSTALL THE TK50 CONTROLLER CABLE IN THE I/O DISTRIBUTION PANEL

- Remove a 1 inch × 4 inch blank insert panel from the I/O distribution panel.
- Insert the ribbon cable connector in the cutout in the I/O distribution panel and secure (Figure 1-11).
- Make sure the red stripe is oriented as shown.

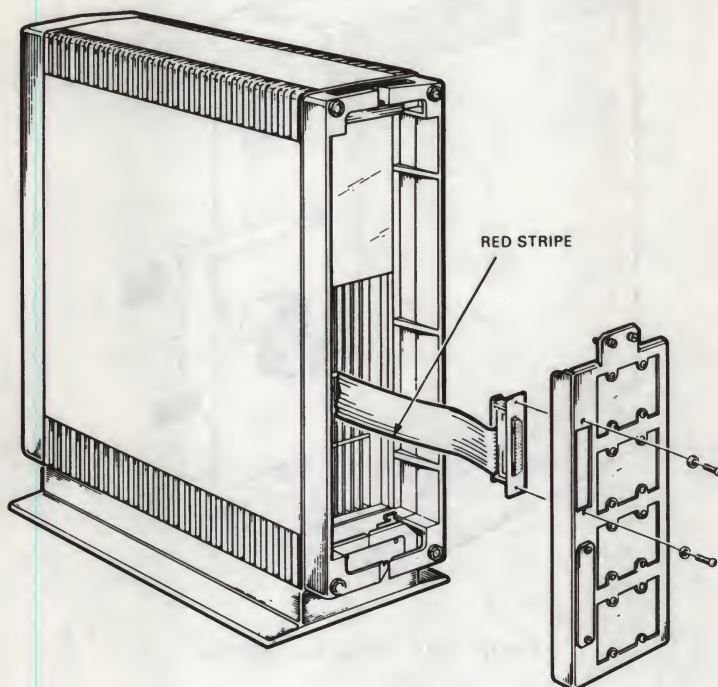


Figure 1-11 Installing the Filter Connector

12 INSTALL ALL OTHER MODULES IN THE BACKPLANE

- Pull the levers back and slide each board firmly in place (Figure 1-12).
- Push the levers forward into the locked position.
- Make sure you install the modules in their original order.

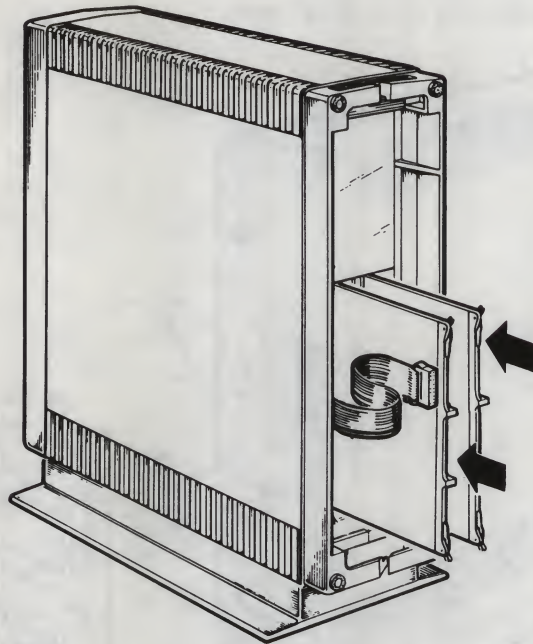


Figure 1-12 Installing Modules

13 CONNECT THE TK50 CONTROLLER CABLE

Make sure the red stripe on the cable is oriented as shown (Figure 1-13).

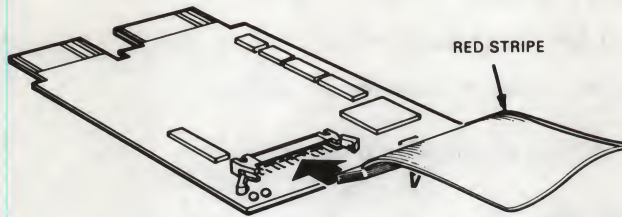


Figure 1-13 Connecting the TK50 Controller Cable to the TK50 Controller Module

14 INSTALL THE I/O DISTRIBUTION PANEL AND ALL CABLES

- Reconnect any other ribbon cables which are present (Figure 1-14).
- Install the ground straps.
- Secure the I/O distribution panel.
- Install all interface cables in their correct locations.

Do not install the power cable at this time.

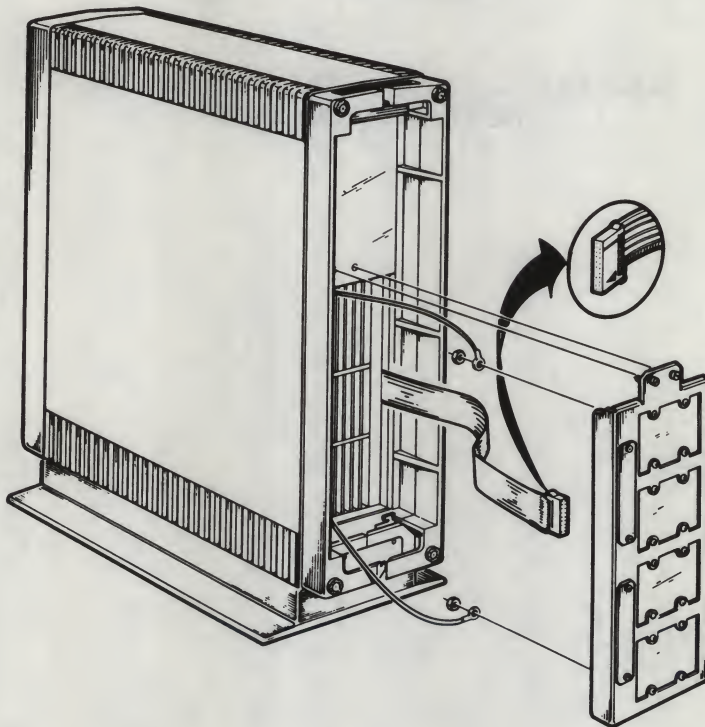


Figure 1-14 Installing the I/O Distribution Panel and Cables

Go to Step 16.

15 REMOVE THE REAR COVER AND POWER CABLE (Figure 1-15)

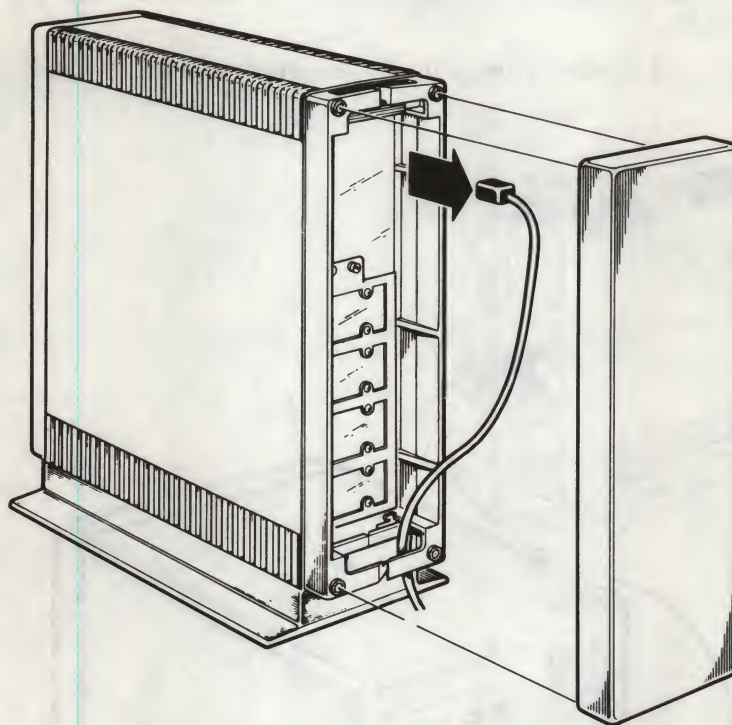


Figure 1-15 Remove Rear Cover and Power Cable

16 CONNECTING A TK50 SUBSYSTEM

- Connect the I/O interface cable to the J1 connector of the TK50 tape drive (Figure 1-16).
- Connect the I/O interface cable to the 50-pin connector in the I/O distribution panel.

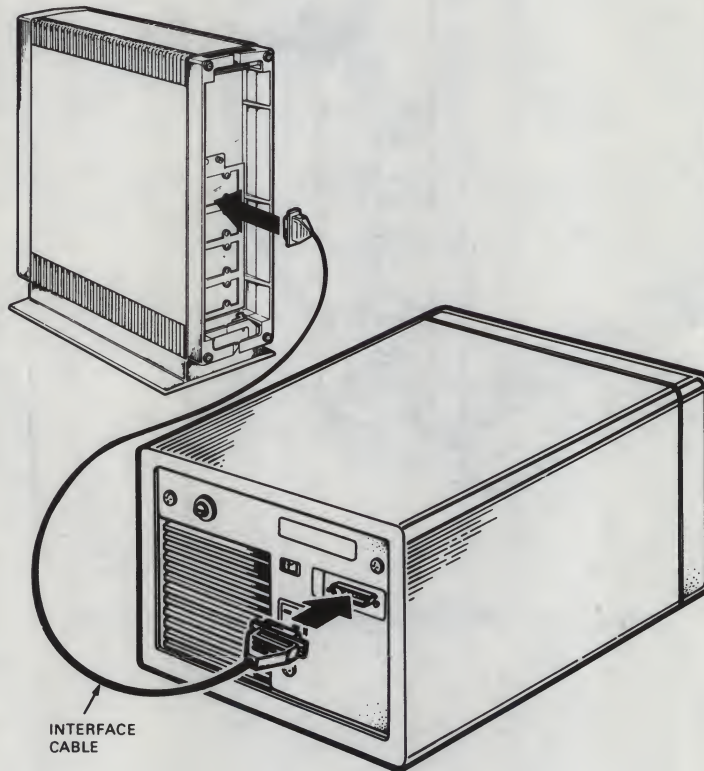


Figure 1-16 Connecting a TK50 Subsystem

Refer to Chapter 3, Technical Description, for a discussion of considerations involved when installing multiple TK50-D, -R tape drives.

17 IDENTIFY THE POWER CABLE AND CHECK THE VOLTAGE SWITCH

Make sure that the plug on the power cable matches the wall outlet (Figure 1-17).

CAUTION

An incorrect voltage setting can damage your subsystem and your computer.

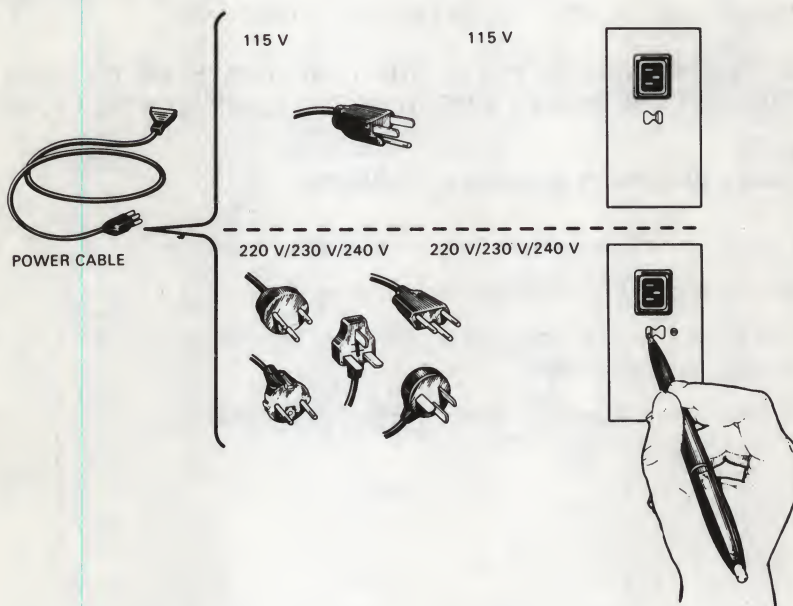


Figure 1-17 Identify the Power Cable and Check the Voltage Switch

18 CONNECT THE POWER CABLE TO THE TK50 SUBSYSTEM AND THE WALL OUTLET

If you are adding the TK50 subsystem to a PDP-11/23 PLUS system, connect the power cable to the power controller in the rack.

19 REPLACE THE REAR COVER

Make sure you place all external cables behind the cable guide.

20 SET THE POWER SWITCH OF THE TK50 SUBSYSTEM TO 1 (ON) THEN SET THE POWER SWITCH OF THE COMPUTER TO 1 (ON)

NOTE

Always turn the TK50 subsystem ON first.

After a few moments, the system displays its start-up message.

You must test your TK50 subsystem before using it.

You can test the subsystem using either the User Test diskettes or the User Test tape cartridge for the computer.

Refer to your system's owner's manual for further information.

Go to Step 21 to test the subsystem using the User Test diskette.

Go to Step 22 to test the subsystem using the User Test tape cartridge.

21 RUN THE USER TEST (DISKETTE)

Insert the diskette and press the Return key (Figure 1-18).

- Micro-11 User Test #1 for MicroPDP-11 and PDP-11/23 PLUS systems
- MicroVAX Maintenance System for MicroVAX II systems

Follow the directions displayed on the screen. Refer to your system's owner's manual for information.

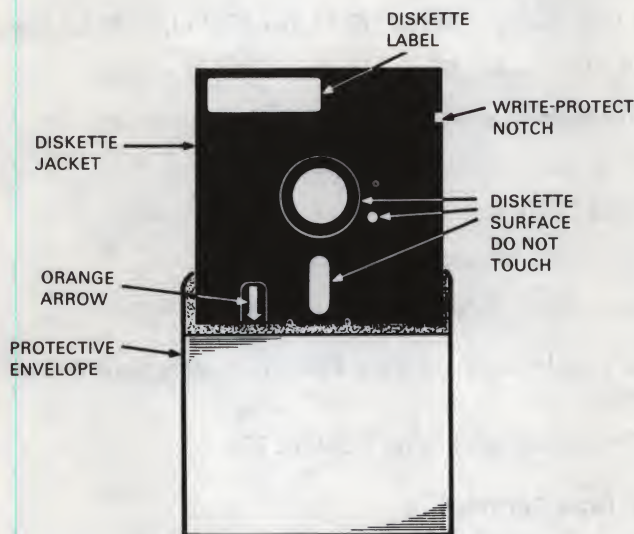


Figure 1-18 User Test Diskette

Upon successful completion of the User Test, the system displays a message similar to the following.

TESTING OF THIS SYSTEM IS NOW COMPLETE.

If you encounter any errors, see Chapter 4, Troubleshooting, for information. Chapter 4 also provides information for extended testing and troubleshooting of the TK50 tape drive. Chapter 3, Troubleshooting, of your system's owner's manual provides additional information.

Go to Step 23.

22 RUN THE USER TEST (TAPE)

Place your fixed disk drive off-line by pressing the Fixed Disk 0 Ready button on the computer's control panel.

Inserting the Tape Cartridge*

- Unlock the tape drive by pushing the cartridge release handle up (Figure 1-19).
- Insert the tape cartridge completely into the tape drive. Make sure the arrow on the tape cartridge faces up.
 - Micro-11 User Test for MicroPDP-11 and PDP-11/23 PLUS systems
 - MicroVAX Maintenance System for MicroVAX II systems
- Push the cartridge release handle down to lock the tape cartridge in place.
- Press the Load/Unload button on the tape drive.
- Press the Restart button on the computer's control panel.
- Follow the directions displayed on the screen.
- Refer to your system's owner's manual for information.

Upon successful completion of the User Test, the system displays a message similar to the following.

TESTING OF THIS SYSTEM IS NOW COMPLETE.

Removing the Tape Cartridge*

- Press the Load/Unload button to signal the drive to rewind and unload the tape. When the red indicator light remains unlit, the rewind and unload process is completed.
- Lift the cartridge release handle and remove the tape cartridge.

If you encounter any errors, see Chapter 4, Troubleshooting, for information. Chapter 4 also provides information for extended testing and troubleshooting of the TK50 tape drive.

* Refer to Chapter 2, Operation, Tables 2-1 and 2-2 and pages 2-8 through 2-10 for a more detailed discussion of the TK50 tape drive controls and procedures.

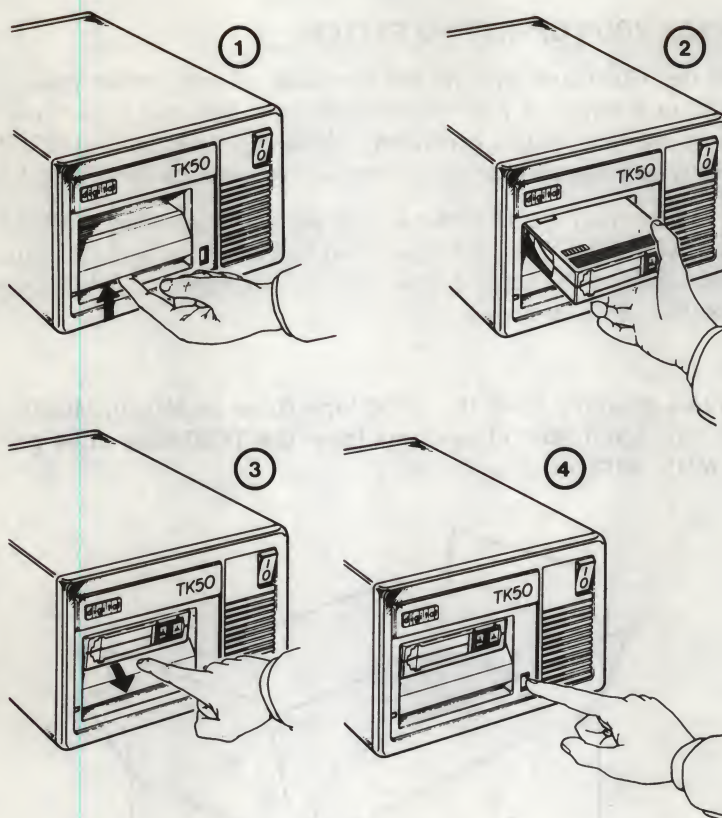


Figure 1-19 Loading a TK50 Tape Drive

23 PREPARE YOUR OPERATING SYSTEM

Before using the TK50 tape drive for the first time, inform your operating system that the TK50 tape drive is a legal device upon which data may be written. To do this, perform a one-time system generation (SYSGEN) or configure (CONFIG) operation. Refer to your software documentation for instructions (Figure 1-20).

If you want to boot from the TK50 subsystem and you have a MicroPDP-11 system with a KDJ11-B CPU module, you need to change the boot translation in the setup table. Refer to Chapter 2, Base System, of the *MicroPDP-11 System Technical Manual* for instructions.

NOTE

MicroVAX systems label the TK50 tape drive as MUA0, MUB0, MUC0, etc. MicroPDP-11 systems label the TK50 tape drive as MU0, MU1, MU2, etc.

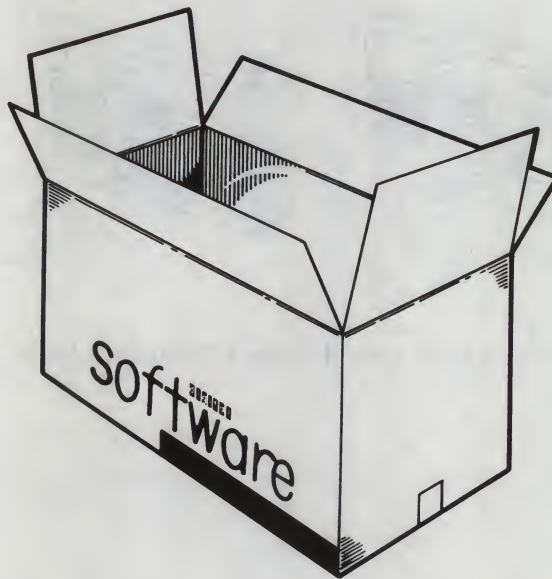


Figure 1-20 Software Instructions

INTRODUCTION

This chapter contains a description of the controls and indicators used to operate the TK50-D, -R subsystem. It is intended as a quick reference for the user. The in-depth explanation of the subsystem is in Chapter 3, Technical Description.

The following information is also provided for users who are not familiar with TK50 tape drives and tape cartridges.

- How to handle and store TK50 tape cartridges.
- How to use the TK50 tape drive.

FRONT PANEL

You control the TK50 subsystem by using the On/Off switch and the Load/Unload button. Two indicator lights show the current operating status of the subsystem (Figure 2-1).

Table 2-1 shows the function of the TK50 subsystem controls. Table 2-2 shows the operating conditions as indicated by the two indicator lights.

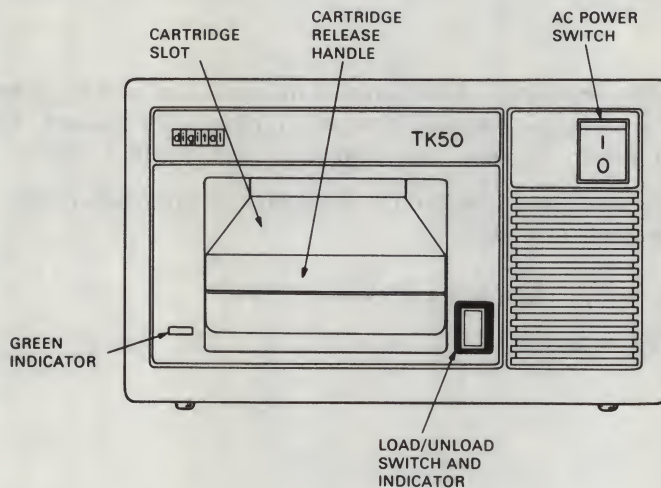


Figure 2-1 TK50 Controls and Indicators

Table 2-1 TK50 Subsystem Controls

Controls	Condition	Function
On/Off	1	Switches the subsystem on.
	0	Switches the subsystem off.
Load/Unload	In	Loads the tape (10–15 seconds).*
	Out	Rewinds and then unloads the tape.
Cartridge release handle	Up	Unlocks the tape drive. The tape cartridge can now be inserted.
		Unlocks the tape drive to remove cartridge after rewind and unload operations.
	Down	Locks tape in position.

* If tape is new, the system performs a calibration sequence that takes approximately two minutes.

Table 2-2 TK50 Subsystem Indicator Lights

Red	Green	Condition
Off	Off	No power to the tape drive.
Off	On	OK to lift cartridge release handle and power is present.
On	Off	Do not lift cartridge release handle. <ul style="list-style-type: none"> • Power-up self-test is occurring. • Cartridge is inserted but handle is still up. • Tape is loading or unloading. • Tape is stopped.
On	On	Tape loaded successfully.
On	Blinking	Tape in motion (except rewind). Read/write commands are being processed. Irregular fast blinking means tape calibration is occurring.*
Blinking	Blinking	Tape is rewinding.
Flashing rapidly		There is a fault. Press and release the Load/Unload button four times. If the problem persists, stop the operation of the tape drive and call your service representative.

* If tape is new, the system performs a calibration sequence that takes approximately two minutes.

REAR PANEL

The rear panel contains one multi-pin connector that is used to connect the TK50 subsystem to your computer. It also has an ac power outlet, a voltage switch, an ac circuit breaker, and the fan exhaust (Figure 2-2).

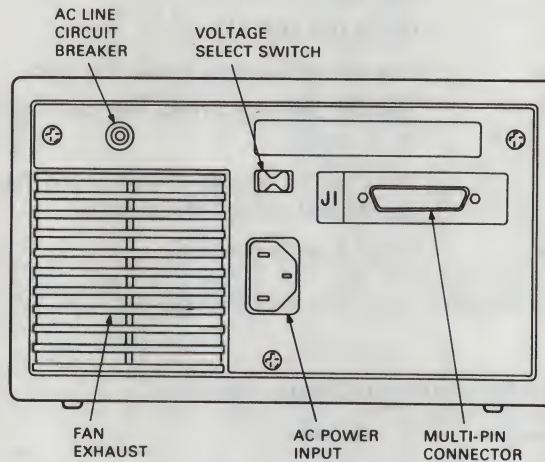


Figure 2-2 Rear Panel Assembly

TK50-D, -R TAPE DRIVE

The TK50 subsystem is a tape drive enclosed in either a free-standing or rack mount housing. Each TK50 subsystem contains its own power supply and fan. The tape drive holds one removable magnetic tape cartridge.

- The TK50 tape stores information magnetically the same way sound is recorded on an audio cassette.
- Each tape cartridge stores up to 94 million characters or roughly 34,800 type-written pages.
- Information stored on a tape can be erased and replaced.
- The TK50 tape cartridge records information only on one side. You must insert the tape cartridge correctly into the tape drive. Make sure the arrow on the tape cartridge faces up (Figure 2-3).

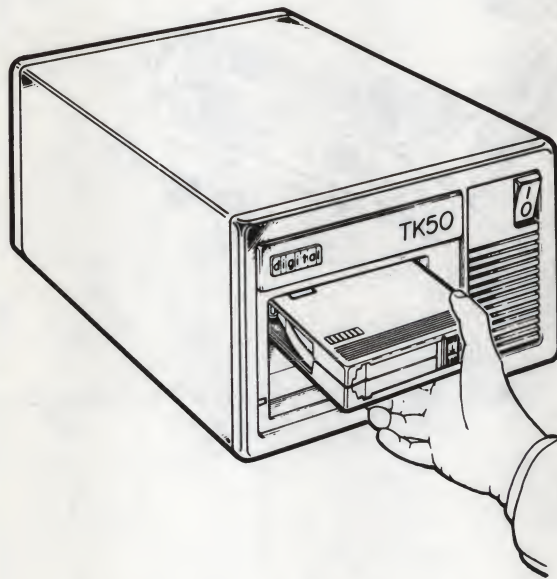


Figure 2-3 Inserting a Tape Cartridge

LABELING A TK50 TAPE CARTRIDGE

- Insert the label in the slot on the front of the tape cartridge (Figure 2-4).
- Do not apply stick-on labels to the top, bottom, or sides of the tape cartridge.
- Do not write on the tape cartridge with a pen or pencil.

WRITE-PROTECTING A TAPE CARTRIDGE

Write-protecting a tape cartridge prevents accidental overwriting of information stored on the tape (Figure 2-4).

Slide the write-protect switch to the left.

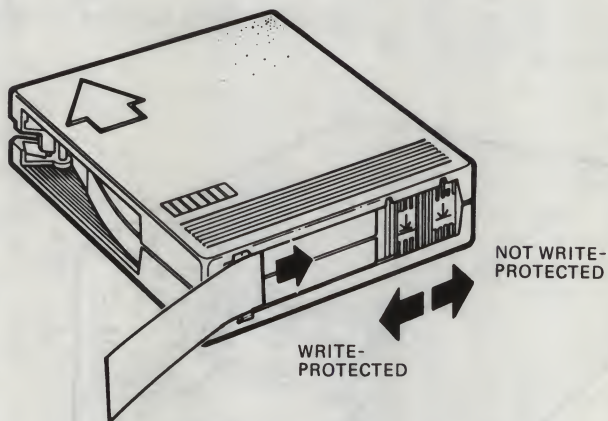


Figure 2-4 Labeling and Write-Protecting a TK50 Tape Cartridge

CARE AND HANDLING OF TK50 TAPE DRIVE AND TK50 TAPES

- Allow any new prerecorded tape to stabilize for 24 hours at room temperature before using it.
- Store tapes in a dust-free environment.
- Store at an even temperature between 10°C–40°C (50°F–104°F).
- Keep the tape drive and tapes away from heaters, photocopiers, and direct sunlight.
- Keep the tape drive and tapes away from magnets and equipment that generate magnetic fields, such as motors and transformers.
- Keep the tape drive and tapes away from terminals and X-ray equipment.
- Never bump or drop the TK50 tape drive.

BACKING UP FILES ON A TK50 TAPE CARTRIDGE

The TK50 tape is an ideal medium for storing backup copies of files created on diskette and fixed disk drives. Refer to your software documentation for instructions to perform a backup or file copy operation.

- Make a daily backup copy of all information you have changed or created that day.
- Make a weekly backup copy of all information stored on your fixed disk drive.
- Store all backup copies in a safe place.

NOTE

Write-protect diskettes and fixed disk drives when making backup copies onto tape to prevent accidental loss of information.

INSERTING A TK50 TAPE CARTRIDGE

- Make sure the Load/Unload button is out.
- Set the TK50 subsystem power switch to 1 (ON), then set the computer power switch to 1 (ON).
 - The red light stays ON during the tape drive power-up self-test (approximately two seconds).
 - The red light goes OFF and the green light goes ON.
- Lift the cartridge release handle (Figure 2-5).
- Insert the tape cartridge completely in the tape drive. Make sure the arrow on the tape cartridge faces up. When the tape cartridge is correctly seated, it locks in place.
 - The red light goes ON.
 - The green light goes OFF.
- Push the cartridge release handle down firmly to engage the gears.
 - The red light goes OFF.
 - The green light goes ON.
- Press the Load/Unload button.
 - The red light goes ON.
 - The green light goes OFF.
- The tape loads in 10-15 seconds to the beginning of tape (BOT).^{*} Loading the tape means that a mechanism inside the tape drive picks up the tape and places it on a take-up reel inside the tape drive.
 - The red light stays ON.
 - The green light goes ON.
- During the time the tape drive is responding to a command to read or write, including the time to seek the correct part of the tape.
 - The red light stays ON.
 - The green light is blinking.

^{*} If tape is new, the system performs a calibration sequence that takes approximately two minutes. The green light blinks fast and irregularly during calibration.

CAUTION

If the red light flashes rapidly at any time, press and release the Load/Unload button four times. If the problem persists, stop the operation of the tape drive and call your nearest service representative. Do not attempt to use the tape drive or remove the tape cartridge.

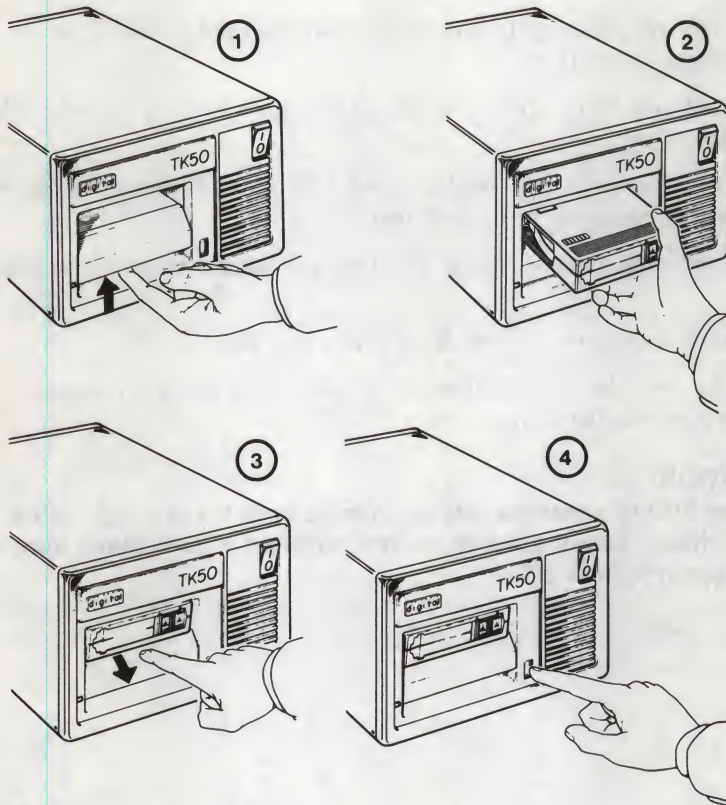


Figure 2-5 Inserting and Removing a Tape Cartridge

REMOVING A TK50 TAPE CARTRIDGE

You must rewind and unload the tape before you can remove the tape cartridge from the tape drive.

- Press the Load/Unload button to rewind and unload the tape. Rewinding a tape can also be done under software control. Refer to your software documentation for information.
 - The red and green lights both blink (slowly, but not in unison) as the tape rewinds to the BOT.
 - The red light stays ON and the green light goes OFF as the tape unloads into the cartridge.
 - The red light goes OFF and the green light goes ON when the tape is completely rewound in the cartridge.
- Lift the cartridge release handle. The tape cartridge pops out far enough to grasp.
- Remove the tape cartridge and store it in a safe place.
- Lower the cartridge release handle. The green light stays ON, showing that there is power to the drive.

CAUTION

Never lift the cartridge release handle until the red light turns OFF. Make sure the lights are not between blinks. Make sure the green light is ON.

INTRODUCTION

This chapter contains two sections. The first section describes the following attributes of the TK50-D, -R tape drive subsystem.

- Physical features
- Operating features
- Environmental requirements
- Power supply
- DC cooling fan
- Front panel controls and indicators
- Rear panel
- Unit numbers designation

The second section discusses the following.

- Configuration rules
- Interrupt vector and module address
- System controller and cable option kits
- MicroPDP-11 and MicroVAX configuration examples
- PDP-11/23 PLUS configuration examples

PHYSICAL FEATURES

The TK50 subsystem (Figure 3-1) is a free-standing mass storage device. You can use it as an add-on to MicroPDP-11, MicroVAX, PDP-11/23 PLUS, and some other Q-Bus hosts. The subsystem can also be expanded into multiple configurations.

The number of possible TK50 subsystems that can be attached to a Q-Bus host depends on the available space in the host backplane and the number of available 50-pin connectors on the I/O distribution panel.

Each TK50 subsystem consists of two major parts.

- A TK50 subsystem tape drive and removable tape cartridge
- A TQK50-AB (M7546) controller module and signal cable

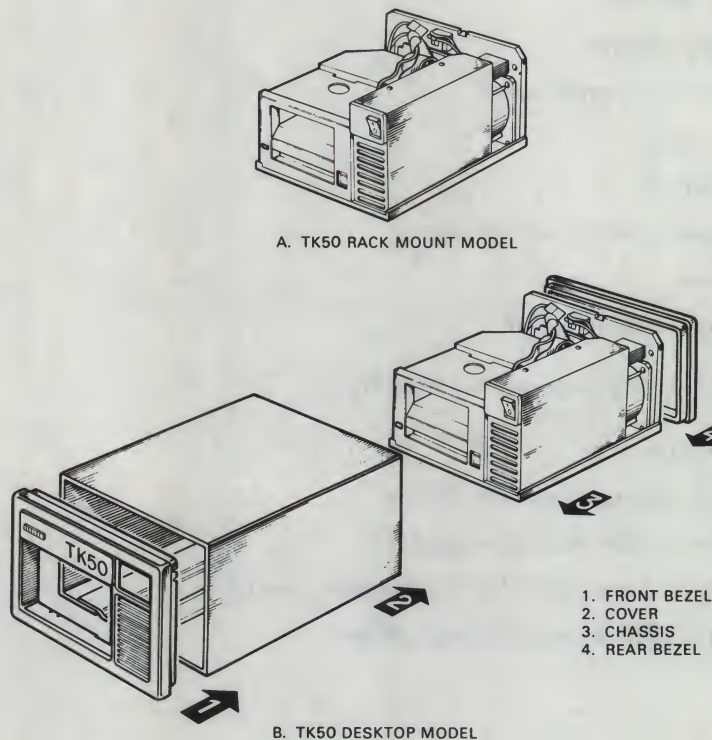


Figure 3-1 Desktop and Rack Mount Subsystems

TK50 Subsystem

The TK50 tape drive is a streaming tape drive subsystem that provides 94 Mbytes of backup data storage and uses Digital magnetic tape cartridges (COMPACTape). Each tape cartridge contains 182.88 m (600 ft) of 1.27 cm (1/2 in) wide tape.

Each TK50 subsystem consists of a mounting chassis that holds the tape drive, power supply, dc cooling fan, printed circuit board for external cable signal distribution, and front and rear panels.

Rack mount units must be mounted within an H9302 rack mount kit. The rack mount kit, which ships separately, holds two subsystems side by side and fits a standard 48.26 cm (19 in) rack. Desktop units have a cover and front and rear bezels already installed.

The subsystem operates with either 120 V (TK50-DA, -RA) or 240 V (TK50-DB, -RB) primary power. Primary power is controlled by using the On/Off switch on the front panel. Refer to Appendix B for specifications.

The TK50 disk drive is a field replaceable unit (FRU). Refer to Chapter 4, Troubleshooting, for FRU procedures.

TQK50-KA (M7546) Controller Module

The M7546 controller module is a dual-height module providing the interface between the TK50 tape drive and the Q22-bus. Figure 3-2 shows the location of two DIP switches on the controller module and the jumpers. Use these DIP switches and jumpers to configure the following.

- Unit number
- Device starting address
- Hardware revision level (set at the factory)

The factory setting of the unit number DIP switch is set for the first M7546 module installed in a system.

The factory setting of the jumpers is set to an address of 17774500. This is the correct address to use for the first TK50 module installed in a system.

The hardware revision level switch is set at the factory and should match the revision level on the back of the module.

Refer to Configuration Rules in this chapter, for guidelines to change these switches and jumpers.

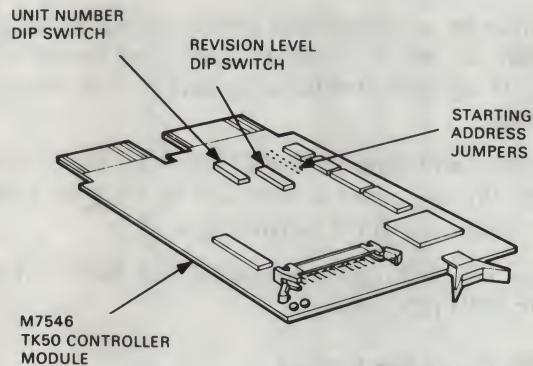


Figure 3-2 M7546 Module

OPERATING FEATURES

The TK50 subsystem operates with the TQK50-AA (M7546) controller module installed in MicroPDP-11, MicroVAX or PDP-11/23 PLUS systems. It provides for backup requirements when installed as an add-on.

The TK50 subsystem is supported by PDP-11 and MicroVMS software and is compatible with the Digital Storage Architecture (DSA) Mass Storage Control Protocol (MSCP).

ENVIRONMENTAL REQUIREMENTS

Tape drives are susceptible to high humidity, shock, and radiated emissions. The tape drive operates within a temperature range of 10°C–40°C (50°F–104°F). Refer to Appendix B for detailed environmental and operating specifications.

POWER SUPPLY

The TK50 subsystem power supply uses either 120 Vac or 240 Vac primary power that is selected by a voltage select switch (VOLT SEL) on the rear panel. The switch is factory set to 120 Vac (TK50-DA, -RA) or 240 Vac (TK50-DB, -RB). The power supply provides:

- +12 A Vdc for the tape drive
- +12 B Vdc for the dc cooling fan
- +5 Vdc for the control logic

The +5 Vdc and +12 Vdc regulators are not adjustable.

The circuit breaker (CB) protection on the primary line includes protection to prevent overheating of the tape medium. Refer to Appendix B for power supply specifications.

DC COOLING FAN

The dc cooling fan receives +12 B Vdc from the power supply. The fan attaches to the internal side of the rear panel and pulls air from the front of the subsystem and exhausts it out the rear.

FRONT PANEL CONTROLS AND INDICATORS

The front panel contains controls and indicators for operating the TK50 tape drive. Figure 3-3 shows the layout of the control panel.

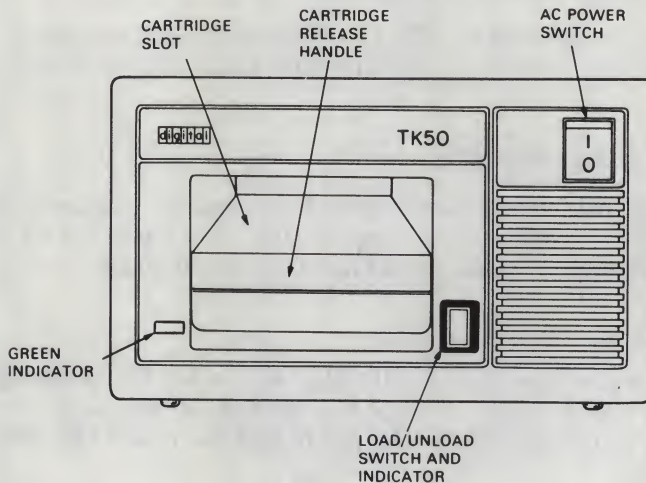


Figure 3-3 TK50 Controls and Indicators

The following list describes the function of the switches and indicators.

On/Off switch – Connects/disconnects ac power to the internal power supply.

Load/Unload button – When this button is pushed in, the tape loads (10–15 seconds). This is the normal operation position. When this switch is released, the tape rewinds and then unloads.

LED indicators – There are two LED indicators. The TK50 Load/Unload button contains an internal red LED. This red LED indicates cartridge release handle and fault conditions. There is a green LED to the left of the Load/Unload button. This green LED indicates tape and power conditions.

Under normal operating conditions, the LEDs indicate the following states.

Red LED

- ON always means that the cartridge release handle may not be raised.
 - Lights for two seconds during power-up self-test
 - Stays ON during operation of the tape
 - Stays ON during the unloading of a tape
- OFF means that it is OK to lift the cartridge release handle and insert or remove a tape cartridge.
- Blinking means the tape is loading or rewinding. The cartridge release handle can soon be raised.
 - Blinks slowly during loading of a tape (10–15 seconds)
 - Blinks slowly during the rewinding of a tape
- Fast flashing always means there is a fault condition. The cartridge release handle cannot be raised.
 - Press the Load/Unload button four times.
 - If the problem persists, there is a hardware fault.

Green LED

- It lights ON under two conditions.
 - When power is present and it is OK to lift the cartridge release handle (red LED OFF)
 - When tape is fully loaded (red LED ON)
- Blinking means the tape is in motion.
 - Blinks slowly during read/write executions (red LED stays ON)
 - Blinks slowly during the rewinding of a tape (red LED blinking)
 - Blinks irregularly during calibration of a new tape (red LED OFF)

REAR PANEL

The rear panel contains the circuit breaker (CB) that fuses the ac power coming into the subsystem and the primary voltage selection switch (VOLT SEL) set for either 120 Vac or 240 Vac. It also contains the ac line connector that accommodates the ac power cord, the dc fan housing exhaust opening, and the J1 connector.

The J1 connector (Figure 3-4) of the TK50 subsystem responds to a drive select signal (DRV SEL 3) on the drive interface cable coming from the host system. Refer to Appendix A for a listing of the J1 connector pin numbers and signal names and for a listing of pins and voltages on the 12-pin power output connector.

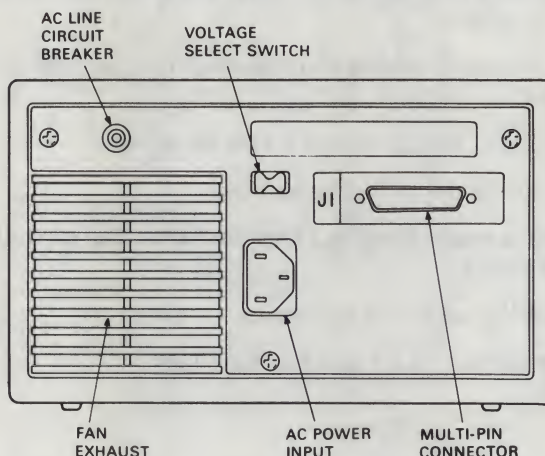


Figure 3-4 Rear Panel

UNIT NUMBER DESIGNATION

The TQK50 controller module supports a single TK50 tape drive. Jumpers on the TQK50 controller module select the starting address for the module, while the unit number DIP switch selects the unit number for the TK50 tape drive connected to that module. The MicroPDP-11 and PDP-11/23 PLUS system software displays the first unit number as MU0. The MicroVAX system software displays the first unit number as MUA0.

Since you cannot install more than one module in the backplane with the same starting address, the jumpers and unit number DIP switch must be changed on a second or third module. On MicroPDP-11 and PDP-11/23 PLUS systems, the unit number is MU1 for a second tape drive; MU2 for a third tape drive. On MicroVAX systems, the unit number is MUB0 for a second tape drive; MUC0 for a third tape drive.

CONFIGURATION

Configuring a TK50-D,-R subsystem into a particular system requires auxiliary equipment. The following sections provide configuration rules and describe the requirements and cables to use for various arrangements. Refer to your system's technical manual, Chapter 4, Configuration, for additional information.

CONFIGURATION RULES

Before installing a TK50 subsystem and TQK50 controller module, you must consider the following factors.

- Module physical priority
- Backplane and I/O distribution panel expansion space
- Power requirement
- Interrupt vectors and module starting addresses

Module Physical Priority

The order in which you place modules in the backplane affects system performance. Install modules according to the following rules.

- Install the CPU in slot 1. Follow the rules for your particular CPU.
- Install memory module(s) following the CPU. Follow the rules for your particular CPU and memory.
- Install dual-height modules in the A/B rows of slots 1 through 3. No grant continuity card is necessary.
- Install dual-height modules in either the A/B or C/D rows of slots 4 through 8. The opposite row must include either another dual-height module or a grant continuity card.
- Install modules following the CPU and memory module using the sequence shown in Table 1-1.

Backplane and I/O Distribution Panel

The number of available slots in the backplane and expansion space in the I/O distribution panel determine how many TK50 subsystems you can install in your system. Figure 3-5 shows backplane arrangements and the I/O distribution panel for the MicroPDP-11, MicroVAX, and PDP-11/23 PLUS systems.

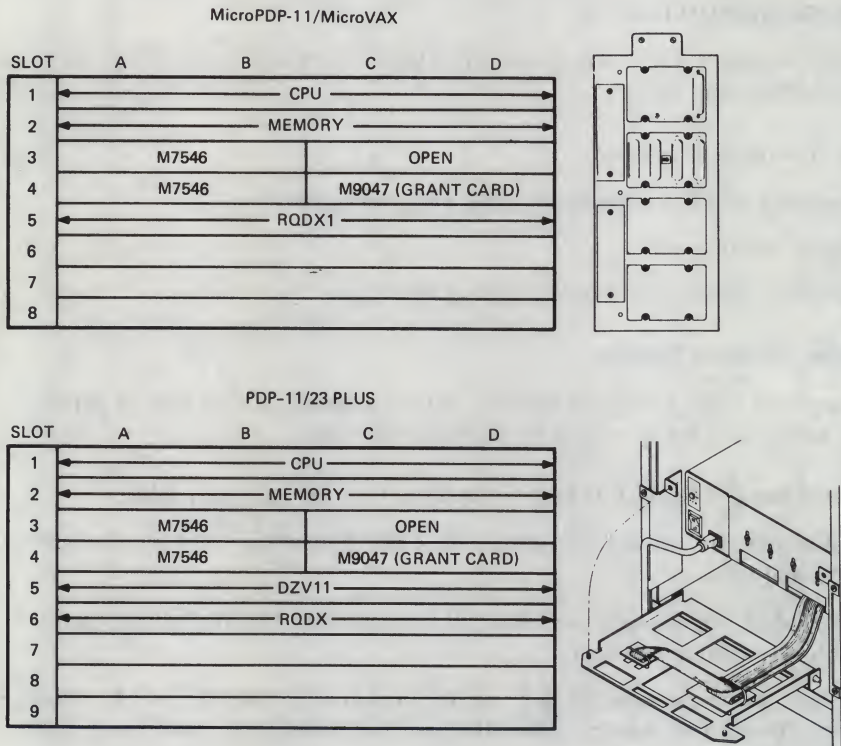


Figure 3-5 Backplane and I/O Distribution Panel Arrangements

Power Requirements

Keep track of the total current and power used to be sure you do not overload the system. Current is measured at +5 Vdc and +12 Vdc. The current and power requirements of each module must not exceed the limits shown in Table 3-1. Table 3-2 lists the current drawn by each module.

Table 3-1 Current and Power Requirement Limits

Power Supply	Current		Power
	+5 Vdc	+12 Vdc	
H7864-A	36 A	7 A	230 W
H7864	36 A	6 A	230 W

Use the configuration worksheet (Figure 3-6) to keep track of the total current and power requirements. There is a full-size worksheet at the end of this book. To use this worksheet, do the following.

1. Write the module and mass storage device name in the columns beside the backplane slot and the mass storage space numbers.
2. Refer to Table 3-2. Enter the +5 Vdc and +12 Vdc currents, power, and I/O distribution panel insert size for each module and mass storage device.
3. The column totals must not exceed the limits listed at the bottom.

ADD THESE COLUMNS

BACKPLANE SLOT	MODULE	CURRENT (AMPS)		POWER (WATTS)	I/O PANEL INSERTS	
		+5 V	+12 V		B (2 x 3)	A (1 x 4)
1 AB						
1 CD						
2 AB						
2 CD						
3 AB						
3 CD						
4 AB						
4 CD						
5 AB						
5 CD						
6 AB						
6 CD						
7 AB						
7 CD						
8 AB						
8 CD						
MASS STORAGE						
1						
2						
TOTAL THESE COLUMNS:						
MUST NOT EXCEED:		36.0	7.0	230	4	2

* IF MORE THAN TWO TYPE A FILTER CONNECTORS ARE REQUIRED, AN ADAPTER TEMPLATE (PN 74-27740-01) MAY BE USED. THIS WILL ALLOW THREE ADDITIONAL TYPE A FILTER CONNECTORS, BUT WILL REDUCE THE AVAILABLE TYPE B CUTOUTS TO TWO.

Figure 3-6 BA23-A Configuration Worksheet

Table 3-2 Power Requirements, Bus Loads, I/O Distribution Panel

Option	Module	Current		Bus Loads		I/O Inserts A=1×4, B=2×3
		+5 Vdc	+12 Vdc	AC	DC	
KDJ11-BC	M8190	5.5	0.1	2.3	1.1	1 × B
KDF11-BE	M8189	5.5	0.1	2.3	1.1	1 × B
MSV11-PK	M8067-K	3.45	–	2.0	1.0	–
MSV11-PL	M8067-L	3.6	–	2.0	1.0	–
KA630-AA	M7606	6.2	0.14	2.7	1.1	1 × B
KA630-AB	M7606	5.9	0.14	2.7	1.0	1 × B
MS630-AA	M7607	1.0	0.0	–	–	–
MS630-BA	M7608	1.3	0.0	–	–	–
MS630-BB	M7608	1.8	0.0	–	–	–
DEQNA-KP	M7504	3.5	0.5	2.2	0.5	1 × A
DPV11-DP	M8020	1.2	0.3	1.0	1.0	1 × A
DRV11-JP	M8049	1.8	–	2.0	1.0	2 × A
DRV11-BP	M7950	1.9	–	3.3	1.0	2 × A
DRV11-LP	M7941	0.9	–	2.8	1.0	2 × A
LPV11-XP	M8027	0.8	–	1.4	1.0	1 × A
DLEV1-DP	M8017	1.0	1.5	1.6	1.0	1 × A
DLVJ1-LP	M8043	1.0	0.25	1.0	1.0	1 × B
DZV11-DP	M7957	1.2	0.39	3.9	1.0	1 × B
DHV11-AP	M3104	4.3	0.48	2.9	0.5	2 × B
DMV11-AP	M8053-MA	3.4	0.38	2.0	1.0	1 × B
DMV11-BP	M8053-MA	3.4	0.38	2.0	1.0	1 × A
DMV11-CP	M8064-MA	3.35	0.26	2.0	1.0	1 × B
DMV11-FP	M8053-MA	3.4	0.38	2.0	1.0	1 × B
DUV11-DP	M7951	1.2	0.39	3.0	1.0	1 × A
TQK25-KA	M7605	4.0	–	2.0	1.0	1 × A
TQK50-KA	M7546	2.2	–	2.0	1.0	1 × A
KLESI-QA	M7740	3.0	–	2.3	1.0	1 × A
RLV12-AP	M8061	5.0	0.10	2.7	1.0	1 × A
RQDX1	M8639-YA	6.4	0.25	2.0	1.0	–
RQDX2	M8639-YB	6.4	0.25	2.0	1.0	–
RCX50-AA	–	0.8	1.8	–	–	
RD51-A	–	1.0	1.8	–	–	
RD52-A	–	1.0	1.8	–	–	
TK50-XX	–	1.5	2.5	–	–	

Interrupt Vectors/Module Starting Addresses

The interrupt vector for the first module (set to 260) is under program control and does not need to be set. The interrupt vector for additional M7546 modules is a floating vector which is set under program control. The starting address of the first module installed in a system is fixed at 1774500. Table 3-3 lists the jumper setting for the first M7546 module.

Table 3-3 M7546 Fixed CSR Address

Module Number	Factory Address	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	← Add. bits (Jumpers *)
First	17774500	I	I	R	R	I	R	I	R	R	R	R	(factory)

* the jumper nearest the module fingers is A2

I = jumper installed

R = jumper removed

The starting address of any additional TQK50 modules installed in your system is a floating address of 17760nnn and is set using the jumpers. Table 3-4 shows the starting address of modules that may be installed in your system. Table 3-5 shows the floating control status register (CSR) address of some common combinations of devices that require configuration.

Check off all the devices in Table 3-4 you want to reconfigure and find the column in Table 3-5 that makes the best match. In most cases, if you do not install a device listed in the middle of the column, the address of the devices that follow change. Observe the following rules.

- Check each module installed in the system.
- Find the column that corresponds to all the installed modules, where:

number = installed

*number = may be installed or not

NOTE

When an address is preceded by an *, the address of the following device(s) does not change.

Assign the floating CSR address according to the numbers shown in Table 3-5. The numbers in Table 3-4 are the last three digits of the address for the module.

Use Table 3-5 to determine the starting address of modules that may be installed in your system.

Table 3-4 Address/Vector Worksheet

Option	Module	Unit No.	.Check if in System	Vector	CSR Address (N=177)
KDJ11-BC	M8190	1	X	-	-
MSV11-PL	M8067	1	X	-	N72100 start add.=0
MSV11-PL	M8067	2		-	N72102 start add.=512
MSV11-PL	M8067	3		-	N72104 start add.=1024
MSV11-PL	M8067	4		-	N72106 start add.=1536
DEQNA	M7504	1		120	N74440
DPV11	M8020	1		V	F
DRV11-JP	M8049	1		V	N64120
DRV11-JP	M8049	2		V	N64140
DRV11-B	M7950	1		124	N72410
DRV11-B	M7950	2		V	N72420
LPV11	M8027	1		200	N77514
DLVE1	M8017	1		V	N75610
DLVJ1	M8043	1		V	N76500
DLVJ1	M8043	2		V	N76510
DZV11	M7957	1		V	F
DHV11	M3104	1		V	F
DMV11-CP	M8064	1		V	F
DUV11	M7951	1		V	N60040
TQK25	M7605	1		224	N72520
TQK50	M7546	1		260	N74500
TQK50	M7546	2		V*	N60404
KLESI-QA	M7740	1		154	N72150
RLV12	M8061	1		160	N74400
RQDX1,2	M8639	1		154	N72150

* The vector for additional TQK50 modules becomes a floating vector and is set under program control.

V = Has floating vector

F = Has floating address

NOTE

If a module has a floating vector and CSR address, additional modules of the same type also have a floating vector and CSR address.

Substitute the numbers below for the nnn in address 17760nnn to find the floating CSR address for a second TQK50 module.

Table 3-5 Floating CSR Address Chart

Option	Common Configurations							
DZQ/V 1				100	100	100	100	100
DZQ/V 2				*110	*110	110	110	110
DZQ/V 3				*120		120		120
DPV11	*270	*270	*270		*310	*330	*310	*330
DMV11			320				340	360
2nd MSCP		334	*354		354	374	374	414
2nd TK50	*404	*444	*444	*444		*504	*504	504
DHV11	440	500	500	500	500	540	540	
DHV11	460	520	520	520	520			

Figure 3-7 shows some of these jumper settings.

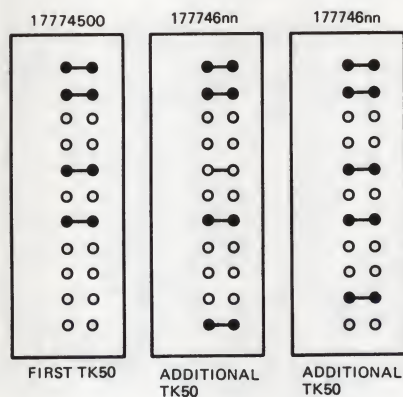


Figure 3-7 Jumper Pack Settings

If the system you wish to configure does not resemble the common configurations shown in Table 3-5, refer to the following list for information. Also refer to your system's technical manual, Chapter 4, Configuration, or your field service representative for help.

- The first DUV11 CSR address is 17760040.
- The first DZV11 CSR address is 17760100 if no DUV11s are present.
- The first DPV11 CSR address is 17760270 if no DUV11s or DZV11s are present.
- The first DMV11 CSR address is 17760320 if no DUV11s, DZV11s, or DPV11s are present.
- The first disk MSCP CSR address is always 17772150.
- The second disk MSCP CSR address is 17760334 if no DUV11s, DZV11s, DPV11s, or DMV11s are present.
- The first tape MSCP CSR address is always 17774500.
- The second tape MSCP CSR address is 17760404 if no DUV11s, DZV11s, DPV11s, or DMV11s are present and no more than one disk MSCP is present.
- The first DHV11 CSR address is 17760440 if no DUV11s, DZV11s, DPV11s, or DMV11s are present and no more than one disk MSCP is present and no more than one tape MSCP is present.

UNIT NUMBER DIP SWITCH

The unit number DIP switch must be set to correspond to the jumper setting. The first setting in Table 3-6 and Figure 3-8 shows the factory setting that matches the jumper setting for a starting address of 17774500. The remaining settings in Figure 3-8 show the DIP switch setting for additional modules set for a starting address of 17760nnn (second device) and 17760nnn (third device) respectively.

Table 3-6 Unit Number Switch Pack Settings

Jumper Set for an Address of	Unit Number Switch Pack Bits								Unit Number Name
	1	2	3	4	5	6	7	8	
17774500	0	0	0	0	0	0	0	0	MU0 (first TK50)
17760nnn	1	0	0	0	0	0	0	0	MU1 (second TK50)
17760nnn	0	1	0	0	0	0	0	0	MU2 (third TK50)
17760nnn	1	1	0	0	0	0	0	0	MU3 (fourth TK50)

0 = Switch open
1 = Switch closed

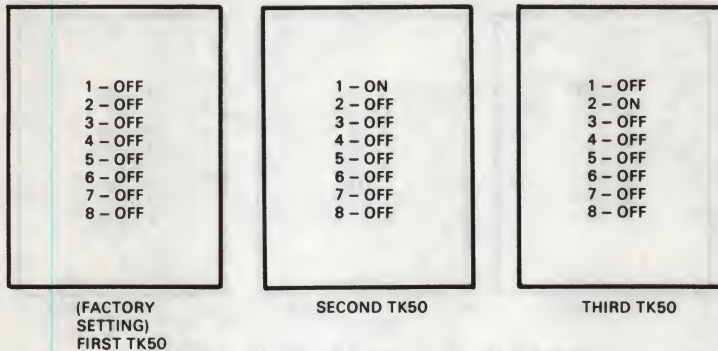


Figure 3-8 Unit Number DIP Switch Settings

Make sure the revision level DIP switch matches the revision level of the module that is stamped on the back (Table 3-7). Figure 3-9 shows several revision level switch settings.

Table 3-7 Revision Level Switch Pack

Revision Level Number	Switch Bits							
	1	2	3	4	5	6	7	8
0	0	0	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0
2	0	1	0	0	0	0	0	0
3	1	1	0	0	0	0	0	0
4	0	0	1	0	0	0	0	0
5	1	0	1	0	0	0	0	0

0 = Switch open

1 = Switch closed

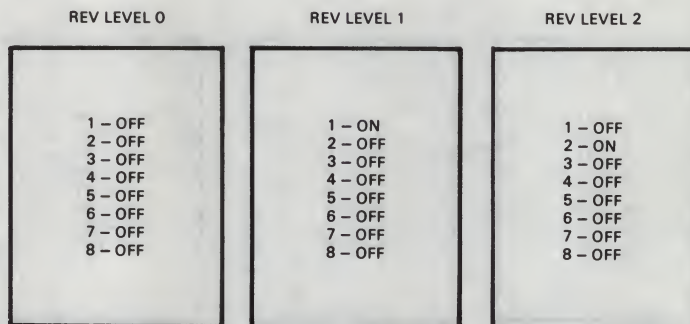


Figure 3-9 Revision Level Switch Settings

SYSTEM CONTROLLER AND CABLE OPTIONS

Table 3-8 describes the function of the components needed to configure various systems.

Table 3-8 System Controller and Cable Option Kits

Model	Description
TQK50-AB	<p>This is the controller and cable for a BA23 enclosure and accommodates the MSCP Q-Bus. One controller handles one TK50 tape drive.</p> <p>Use this kit when configuring a MicroPDP-11 or MicroVAX system in a BA23 enclosure.</p>
TQK50-PB	<p>This kit is identical to the one above except the controller cable accommodates a PDP-11/23 PLUS system.</p> <p>Use this kit when configuring a PDP-11/23 PLUS system.</p>
17-00484-01	<p>This 2.75 m (9 ft) host-to-external-drive interface cable is a 50-pin "D" subminiature male to a 50-pin "D" subminiature male, shielded, molded cable. This cable comes with the TK50 subsystem.</p>

MicroPDP-11 AND MicroVAX CONFIGURATION

A BA23 enclosure (MicroPDP-11 and MicroVAX), prior to any add-on TK50 subsystem, contains the following.

- 1 RQDX1 controller
- 1 CK-RQDX1-KA cabinet kit
- 1 RD5n-A (drive only)
- 1 RX50-AA (drive only)

Figure 3-10 illustrates how to add a single TK50 subsystem to a MicroPDP-11 or MicroVAX (BA23 enclosure). In this configuration, the BA23 enclosure already contains two inboard drives (an RD5n-A and an RX50-AA), a RQDX1 controller, and the internal cable (CK-RQDX1-KA).

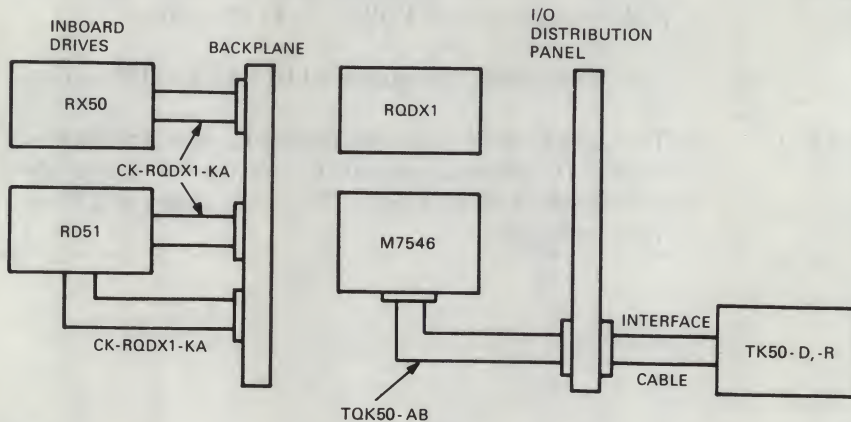


Figure 3-10 One TK50 Subsystem with a BA23 Enclosure

The requirements for adding the external TK50 subsystem are as follows.

- 1 TQK50-AB controller module and signal cable
- 1 TK50-D subsystem or 1 TK50-R subsystem with 1 H9302 rack mount kit

Figure 3-11 shows the addition of a TK50 subsystem to a MicroPDP-11 or MicroVAX that has an RD5n subsystem.

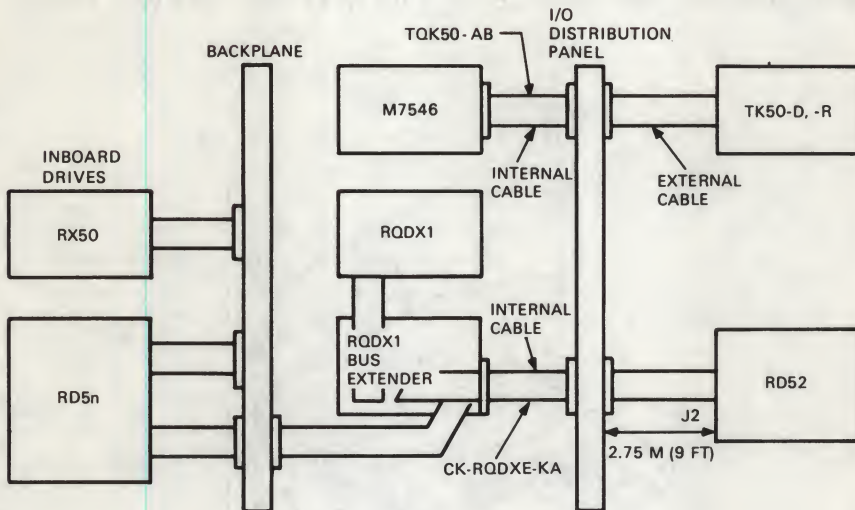


Figure 3-11 One TK50 Subsystem with One RD5n Subsystem with a BA23 Enclosure

PDP-11/23 PLUS CONFIGURATION

To accommodate external add-on drives, a PDP-11/23 PLUS system requires a TQK50-PB controller and cable connected to the H349 distribution panel (Figure 3-12).

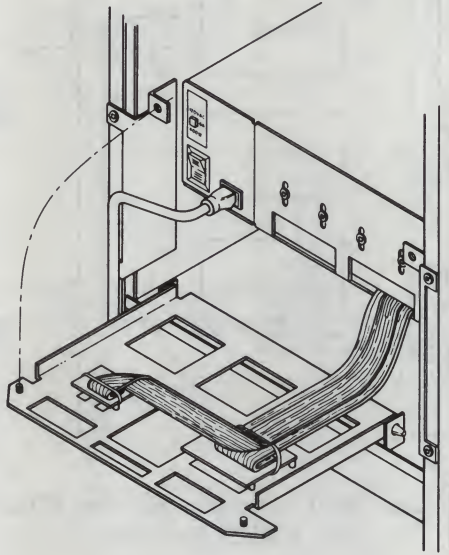


Figure 3-12 H349 Distribution Panel

The H349 I/O distribution panel contains areas for use in system expansion. The cabinet kits contain the cabling for system expansion. This cabling connects to a proper connector on the internal side of the I/O distribution panel. The subsystem user can simply connect to the external connector on the panel.

Figure 3-13 illustrates a single TK50 subsystem add-on to a PDP-11/23 PLUS system through the H349 panel. This arrangement is suitable for a range of applications involving a single add-on TK50 subsystem.

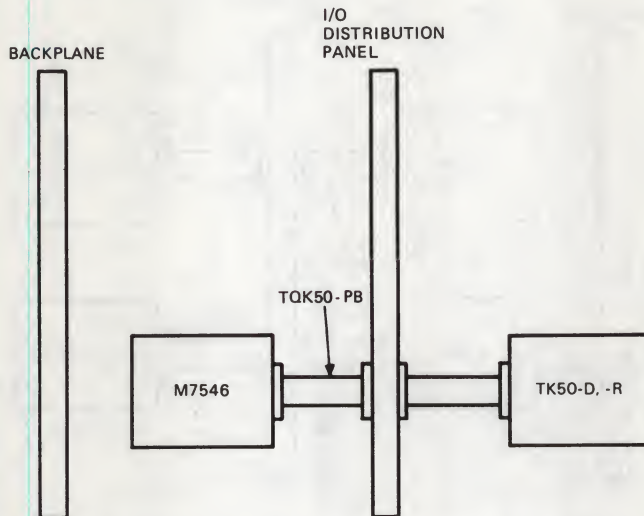


Figure 3-13 One TK50 Subsystem Add-On for a PDP-11/23 PLUS System

The requirements for adding this single external drive to the PDP-11/23 PLUS system are as follows.

- 1 TQK50-PB controller and internal cable
- 1 TK50-D subsystem or 1 TK50-R subsystem with 1 H9302 rack mount kit

Figure 3-14 illustrates how to add two TK50 subsystems to a PDP-11/23 PLUS system.

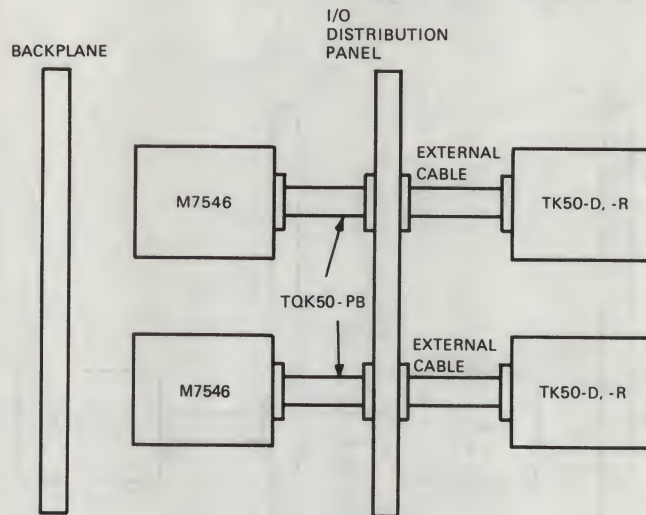


Figure 3-14 Two TK50 Subsystems with a PDP-11/23 PLUS System

The requirements for adding two subsystems are as follows.

- 2 TQK50-PB controllers and internal cables
- 2 TK50-D subsystems or 2 TK50-R subsystems with 1 H9302 rack mount kit

INTRODUCTION

Troubleshooting is the process of isolating and repairing problems. System diagnostic tests check almost every part of the system each time you turn the system on. In addition, the MicroPDP-11 and MicroVAX User Test and field service diskettes and tapes contain extended tests for the circuitry and various devices that may be installed on the system.

Troubleshooting of the TK50 subsystem involves one or more of the following.

- Running the system User Test
- Running the program from the system boot/diagnostic ROM
- Running the extended field service tests

Refer to your system's owner's manual for User Test instructions. Refer to your system's technical manual for system boot/diagnostic-ROM testing and extended field service testing procedures.

This chapter provides the following information.

- A basic troubleshooting check list (page 4-2)
- Extended TK50 diagnostic tests for MicroPDP-11 systems (page 4-4)
- Extended TK50 diagnostic tests for MicroVAX II systems (page 4-19)
- Removal and replacement procedures (page 4-25)

TROUBLESHOOTING TABLES

From time to time you may encounter an error that is not related to system diagnostic tests. Table 4-1 is a basic checklist of some of these problems, their possible cause, and ways to correct them. The corrective procedures listed here are for minor problems.

NOTE

Major repair or replacement of any parts of this subsystem should be carried out only by qualified repair personnel.

Table 4-1 Basic Troubleshooting Checklist

Problem	Possible Cause	Corrective Action
System does not start from the subsystem.	Power cable is not plugged in or power switch is off.	Plug in the subsystem power cable. Make sure the power switch is set to 1 (on).
	Subsystem cable is loose.	Make sure the subsystem cable is firmly installed.
	The Halt button on the host is pressed in.	Press and release the host Halt button. The Halt button should not be lit.
	The circuit breaker has tripped.	Press and release the circuit breaker on the back of the subsystem.
TK50 tape drive passes power-up test but does not work.	No tape or not loaded.	Insert tape and press the Load/Unload button to load the tape.
	The controller module/cable may be faulty.	Call your service representative or run the field service tests.

Table 4-1 Basic Troubleshooting Checklist (Cont.)

Problem	Possible Cause	Corrective Action
TK50 RED indicator light flashes rapidly.	Problem with the tape drive.	Press the Load/Unload button four times. If the problem persists, call your service representative or replace the drive.
Not configured or illegal device name message.	Operating system does not know a TK50 tape drive is present.	Perform a SYSGEN or CONFIG operation. See Installation, Step 21, or call your service representative.
Cartridge release handle does not lift.	Power-up test still in process.	Wait for the red indicator light to go out and try again. If the problem persists, call your service representative.
Tape does not unload.	Load/Unload button is in load position.	Make sure the Load/Unload button is in the unload position. Wait for the red indicator light to go out before removing the tape cartridge.
Tape read error message.	The tape may be bad.	Try starting the tape again. If the problem persists, try another tape.
Tape write error message.	The tape is write-protected.	Slide the write-protect switch on the tape cartridge to the right. If the problem persists, try another tape.

TK50 EXTENDED TESTING WITH MicroPDP-11 SYSTEMS

When you turn on the TK50 subsystem or run the User Test, you may see one or more messages displayed on your terminal. The level 1 TK50 microdiagnostics run at power-up and are contained in the controller.

These tests can also be started by the host and run under the XXDP+ supervisor. The following sections provide information for extended testing of the TK50 tape drive using the field service diagnostic tests provided with the host system or with the TK50 tape drive.

If a fault occurs, call your service representative or run the XXDP+ diagnostic tests to isolate the failing component.

NOTE

These procedures require extensive knowledge of the XXDP+ diagnostic software and should only be carried out by trained service representatives.

Use the following tests to isolate faults related to the TK50 tape drive or the M7546 tape controller module.

- **CZTKAn** Functional Diagnostics/Verify Mode runs the Level 1 microdiagnostics and tests power-up and the controller.

Functional Diagnostics/Execute Mode runs the level 2 microdiagnostics and tests the TK50 tape drive.

- **CZTKBn** Data Reliability Test runs under the XXDP+ supervisor. It tests error rate over time and detects functional faults only. It does not test to the FRU level.

A brief discussion of each of these tests starts on page 4-7. Refer to your system's technical manual for directions and a general discussion of the XXDP+ supervisor and the DEC/X11 run-time exerciser. For additional information on the diagnostic system, refer to the following documents.

- The DEC/X11 User's Manual (AC-F053-MC)
- The DEC/X11 Cross Reference Manual (AC-F055C-MC)
- The XXDP+/SUPR User's Manual (AC-F348A-MC)

R ZTKA ??
ΣTKB ??

CZTKA User Interface

When you run these tests under the XXDP+ supervisor, the program prompts you for answers to the following hardware questions. These questions let you establish certain operational parameters of the program.

Hardware Questions – This set of questions must be answered when the program is first started.

CHANGE HARDWARE (L)?

This question is asking if you want to reconfigure the unit under test.

For the first pass of the program, enter YES and press the Return key.

NUMBER OF UNITS (D)

N stands for the total number of units you are testing.

Enter 1-n and press the Return key.

UNIT X

Prompts for additional information on each unit under test.

Enter 1, 2, or 3 ...

The program can test only one unit at a time. If your answer to the number of units question is more than 1, the program loops and tests each additional unit. For the second pass of the program, you enter 2 to the UNIT X question.

BASE ADDRESS (X)

The first module in the system has a CSR address of 17774500. Additional modules have a floating CSR address of 17760nnn.

Enter the CSR address for the module being tested and press the Return key.

VECTOR (X)

Type the vector for the module being tested.

For the first module, enter 260 and press the Return key.

UNIT NUMBER

Enter the MSCP specified unit number for each unit and press the Return key. For example, MU0, MU1.

CZTKA Message Format

The TK50 diagnostic programs display messages in two formats as shown in the following examples.

Format 1 – Host level 1 testing programs use the following.

CZTKA DVC FTL ERR eee ON UNIT ll TST tt SUB ss PC; XXXXXXX

SA REG CONTENTS INCORRECT

IN INIT SEQUENCE STEP #: n

SA EXPECTED: YYYYYY SA RECEIVED: ZZZZZZ

*****FAILING FRU: CNTL

- eee A discrete error number defined by the program.
- ll The logical unit number assigned to the unit-in-error when you answered the hardware question.
- tt The test number during which the error occurred.
- ss The subtest number.
- XXXXXX The program location of the error call.
- n The step number of the U/Q-Bus storage system protocol (UQSSP) initialization sequence which detected the error condition.
- YYYYYY The expected contents of the SA register for this step.
- ZZZZZZ The actual SA register contents.

Format 2 – Controller level 2 testing programs use the following.

CZTKAA DEV FTL ERR eee ON UNIT ll TST tt SUB ss PC: XXXXXX

DRIVE COULD NOT OVERWRITE

FAILING U-DIAG #:6

TRACK: nn PHYS. BLK: pppppp ERR TYP: YYY RETRIES: rr

DRIVE ERROR BYTE: ddd

*****FAILING FRU: DRV

- eee A discrete error number defined by the program.
- ll The logical unit number assigned to the unit-in-error when you answered the hardware question.
- tt The test number during which the error occurred.
- ss The subtest number.
- XXXXXX The program location of the error call.
- nn Logical track number where the error occurred.
- pppppp Physical block number at which the error occurred.
- YYY The type of error as defined by the TK50 diagnostic error log specification.
- rr The number of retries, if any, while trying to overcome the error.
- ddd The drive error condition detected by the drive. This line is not included if no drive error is detected.

Level 2 Microdiagnostics Test Descriptions

The level 2 microdiagnostics test the read and write operations of the TK50 tape drive. The program prompts the user to insert a scratch tape cartridge into the tape drive. The host system bypasses these tests if no tape is present. The program reports recoverable errors. It reports nonrecoverable errors as fatal device errors.

Test 10 of the level 1 microdiagnostics performs the following sequence of tests twice to make sure that both channels of the head receive equal testing. The program runs the entire sequence first at the physical beginning of the tape (BOT) using head channel 1. The tape is then positioned at the physical end of the tape (EOT), and the sequence repeats using head channel 2. At the end of the test, the tape rewinds and is left at the physical BOT of the tape.

The following test descriptions provide a summary of each of the level 2 microdiagnostic tests.

Test 1 – Simple Write/Read Test – Test 1 verifies basic write/read capability.

This test writes several blocks of 1F and 2F data to the tape, rewinds the tape, and reads the information back. The program performs a compare operation of the read back function.

Test 2 – Streaming Write/Read Test – Test 2 verifies that the drive can write and read over a fairly long distance while in a normal operational mode.

This test writes various data patterns on a single track and on a set length of tape while the tape is streaming. The tape rewinds and reads while the tape is streaming.

Test 3 – Thrashing Write/Read Test – Test 3 verifies that the tape tracking and tension are not affected by frequent direction changes.

This test writes data patterns on a single track and inserts delays between the write blocks to force thrashing. After rewinding, the program reads the blocks with forced delays between reads.

Test 4 – Peak Shift Test – Test 4 verifies that the write precompensation logic is functioning properly.

This test repeats Test 2 using the worst case Modified Frequency Modulation (MFM) peak shift patterns.

Test 5 – Signal Sag Test – Test 5 detects self-erasure of recorded data.

This test writes a set length of tape with blocks of 2F data. The tape rewinds and moves back and forth while stepping the head up and down. The program positions the tape at the logical BOT for the recorded track and reads back.

Test 6 – Overwrite Test – Test 6 guarantees that the drive is capable of overwriting previously recorded data.

This test writes a MW data pattern over a set length of tape on a signal track. The tape rewinds and the program rewrites the data pattern.

Test 7 – Track Access Test – Test 7 verifies tape tracking and the drive's ability to successfully record and retrieve data on adjacent tracks.

This test writes a set number of blocks of data on a signal track. The tape rewinds and steps to the next track. This sequence repeats until all the tracks are written. The test then rewinds the tape and reads back all the blocks from all the tracks.

Test 8 – Positioning Test – The first time through the test sequence, the program positions the tape at the physical EOT of the tape. This lets the entire testing sequence repeat using channel 2 of the head. The second entry into this test causes the tape to be positioned back at the physical BOT of the tape.

This test includes a watchdog timer to guard against a hung drive condition.

CZTKB Data Reliability Test

The Data Reliability Test runs under the XXDP+ supervisor and establishes the performance quality of each unit being tested. The data reliability program detects functional faults but it does not isolate faults to the FRU level. The Data Reliability Test requires 28 Kbytes of memory.

This program supports all of the PDP-11 Diagnostic Supervisor flags with the following exceptions.

- LOE – Loop-on-error
- IDR – Inhibit drop units

CZTKB Program Operation

The data reliability test takes 1 hr and 10 min when it is run in default mode. If the field engineer tells it to run other tests or to run multiple passes, the time is considerably longer.

Hardware Questions – This set of questions must be answered when the program is first started.

CHANGE HARDWARE (L)?

This question is asking if you want to reconfigure the unit under test.

For the first pass of the program, enter YES and press the Return key.

NUMBER OF UNITS (D)

D stands for the total number of units you are testing.

Enter 1-d and press the Return key.

TK IP ADDRESS

The first module in the system has a CSR address of 17774500. Additional modules have a floating CSR address of 17760nnn.

Enter the CSR address for the module being tested and press the Return key.

TK VECTOR ADDRESS

Type the vector for the module being tested.

For the first module, enter 260 and press the Return key.

T/MSCP UNIT NUMBER

Enter the tape mass storage control protocol (TMSCP) specified unit number for each unit and press the Return key. For example, 0,1,2,3.

Software Questions – Answering the software questions is optional. Use a <CR> or <CTRL/Z> to obtain the default values. The following list provides the default values for each question.

Change Software	No Default
ENABLE TIME OF DAY CLOCK (L)	(N)
INPUT HOUR IN 24 HOUR FORMAT	
(OMIT LEADING ZEROS) (D)	(0)
INPUT MINUTES (OMIT LEADING ZEROS) (D)	(0)
CHANGE CONTROLLER PARAMETERS (L)	(N)
ENABLE CONTROLLER ERROR CORRECTION (L)	(Y)
ENABLE CONTROLLER ERROR RECOVERY (L)	(Y)
ENABLE BAD BLOCKING (L)	(Y)
CHANGE PRINTER PARAMETERS (L)	(N)
ENABLE SOFT ERROR REPORT PRINTING (L)	(N)
ENABLE READ SOFT ERRORS ONLY (L)	(N)
CLEAR MEDIA TABLE ON EVERY PASS (L)	(N)
ENABLE MEDIA DEFECTS TABLE PRINTOUTS (L)	(N)
ENABLE PROGRAM VARIABLES DUMP ON ERROR (L)	(N)
ENABLE CLEAR STATUS ON FATAL ERROR (L)	(N)
CHANGE TEST PARAMETERS (L)	(N)
DATA PATTERN (D)	(0)
RUN TEST 3 ONLY (L)	(Y)
ENABLE DATA COMPARES IN TEST 5 (L)	(Y)
ENABLE PRINT READ BUFFER IN TEST 5 (L)	(N)
CHANGE COMMAND SEQUENCE (L)	(N)

CZTKB Error Reporting

The data reliability test provides a variety of information in its error printouts. The following sections briefly discuss error reporting.

Commands – All error printouts contain a field indicating the command on which the error was detected. Table 4-2 provides a list of these command abbreviations and their definitions.

Table 4-2 Error Printout Commands

Abbr.	Definition	Abbr.	Definition
RD	Read	WRT	Write
CMP	Compare host data	ACC	Access
SPC	Space records (position)	WTM	Write tape mark
SKP	Skip tape marks (position)	ERS	Erase
SPO	Space objects (position)	ERG	Erase gap
AVL	Available	ONL	On-Line
SUC	Set unit characteristics	REW	Rewind
ABO	Abort	GCS	Get command status
GUS	Get unit status	SCC	Get controller characteristics

Status, Log Packet, and Program Errors – Each message also includes one line of text describing the type of fault that can originate in any one of three sources. Table 4-3 shows three possible messages and their sources.

Table 4-3 Sample Messages and Their Source

Sample Message	Source
Invalid command issued	Status error code
Data overrun	Error log packet
Program command timeout	Program detected error condition

Drive Errors – When a drive error occurs, the response packet contains a sub-status code. This code is the drive error byte as returned by the drive. The program places this value in the upper bits of the status field. Table 4-4 provides a list of these status values, the corresponding error numbers, and the cause of the failure.

Table 4-4 Data Reliability Test Status Drive Errors

Status	Error	Description
000013	00	Write lock violation
002013	04	Communication exception (timeout, etc.)
003013	06	Wrong track error (following a turnaround)
010013	10	Synchronization failure (write/read)
100413	81	Failure to load to BOT
101013	82	Failure to unload tape into cartridge
101413	83	General motor or tach failure
102013	84	Motor A failure
102413	85	Motor B failure
103013	86	Drive lost control of tape or bad tach
103413	87	Excessive drag in tape transport
104013	88	Failure to stop tape or remain stopped
104413	89	Cartridge insert error
105013	8A	Cartridge extract error
105413	8B	CU attempted to move tape with drive in error
106013	8C	Deceleration timeout error
106413	8D	Second attempt to balance reels in unit failed
110013	90	8155 RAM memory failure in self-test
110413	91	8155 timer failed
111013	92	Read amplit (Hd 1) to low in calibrate
111413	93	Read amplit (Hd 2) to low in calibrate
112413	95	EOT sensed in R/W/S
113013	96	BOT sensed in R/W/S
113413	97	Drive block address overflow
114013	98	Drive block address underflow
114413	99	Servo-error excessive speed variations
115013	9A	Failure in tracking (presently not used)
115413	9B	Command error (not recognized)
116013	9C	Illegal command (incompatible with drive state)
116413	9D	Write lock error
117013	9E	Write gate at wrong time

Table 4-4 Data Reliability Test Status Drive Errors (Cont.)

Status	Error	Description
117413	9F	No write gate for calibration track write
120013	A0	Error sensing cal track 1 (bad head)
120413	A1	Error sensing cal track 2 (bad head)
121013	A2	Detection of edges of cal trk 1 out of spec
121413	A3	Detection of edges of cal trk 2 out of spec
122013	A4	Offset of cal trk 2 from 1 is too great
122413	A5	Search for bottom edge of tape failed
123013	A6	Bottom tape edge tolerance error
123413	A7	Drive is overheating
124013	A8	No current in LED of BOT sensor (cable)
124413	A9	Hall switch sense lines Motor A questionable
125013	AA	Tachometer failure

Hard Error Reports – Hard error reports occur when a recovery process is not successful. The user can disable these reports. Hard error reports typically have the following format.

```
CZTKB HRD ERR 0014 ON UNIT 00 TST 003 SUB 000 PC: 020460
HARD DATA ERROR
COMMAND: RD T/MSCP UNIT: 000 (O)
PASS: 1 (D) DATA PAT: 01 (O)
RECORD BYTE COUNT: 457 (D)
OBJECT CNT : 000000026352 (O)
```

RESPONSE PACKET

HIGH WORD	LOW WORD
000000 (O)	026532 (O)
000000 (O)	000000 (O)
000050 (O)	010240 (O)
000000 (O)	000733 (O)
000000 (O)	000000 (O)
000000 (O)	000000 (O)
000000 (O)	000000 (O)
000000 (O)	001413 (O)
000000 (O)	000733 (O)

Soft Error Reports – Soft error reports occur when a recovery process is successful. The user can disable these reports. These reports include the number of retries necessary to successfully complete the current operation. Soft error reports typically have the following format.

```
CZTKB SFT RD ERR 00014 ON UNIT 00 TST 003 SUB 000 PC: 020460
ECC RECOVERED DATA ERROR
COMMAND: RD T/MSCP UNIT: 000 (O)
PASS: 1(D) DATA PAT: 01 (O)
OBJECT CNT : 000000026352 (O)
TAP OBJ CNT: 000000026352 (O)
TRK NUM: 6 (D) LEVEL: 0 (O) RETRIES: 1 (D)

LOG BLK NUM: 0 (D) PHYS BLK NUM: 9932 (D)
DRV CODE: 000 (O) DRV FLGS: 041 (O)
DRV STATE: 000000 (O) INTERN STATUS: 002 (O)
TAP CNT 0: 227 (O) TAP CNT 1: 015 (O)
TAP CNT 2: 035 (O) RD/WR STATE: 000000 (O)
OPER FLGS: 000000 (O)
```

CZTKB Data Reliability Test Description

The following test descriptions provide a summary of each of the data reliability tests.

Test 1 – Basic Function Test – Test 1 executes a subset of the available commands on the unit under test. It serves as a quick verify test and makes sure the unit can move tape and write/read without error.

Test 2 – Quick Verify Write/Read Test – Test 2 rewinds the tape, writes a record set, writes to the logical end of tape (LEOT), and rewinds. It then repositions the tape to the just written record set and reads the current record set before skipping to the LEOT.

This test repeats five times or until it encounters a fatal error. It permits retries, fixed record length, fixed number of records/sets, and predetermined data patterns.

Test 3 – Complex Write/Read Test – Test 3 rewinds the tape, writes N records, writes a tape mark, and then repeats this sequence until the EOT is reached where it writes two tape marks. The tape rewinds, reads N records, and spaces one record (should see unexpected tape mark). This sequence repeats until the program reaches the LEOT.

This test uses all data patterns including random data and randomly selects the number of records (N) and the record size. This sequence permits hardware retries and runs until EOT, LEOT, or a fatal error is encountered.

Test 4 – Write Interchange Tape – Test 4 rewinds the tape and then writes until EOT or it encounters a fatal error. This test keeps track of the number of records and files that are written. If a fatal error occurs, the tape rewinds and the program prevents the unit from executing any further write operations.

Test 5 – Read Unknown Tape – Test 5 rewinds the tape and then reads until EOT or it encounters a fatal error. This test keeps track of the number of records and files that are read. If a fatal error occurs, the tape rewinds and the program prevents the unit from executing any further read operations.

NOTE

Tests 4 and 5 can be used to perform a media interchange test for multiple drives. The program does not attempt to determine if the unit writing the tape or the unit reading the tape is at fault when an error occurs.

TK50 EXTENDED TESTING WITH MicroVAX II SYSTEMS

When you turn on your TK50 subsystem or run the User Test, you may see one or more messages displayed on your terminal. The system hardware generates these messages and, in most cases, they indicate that there is a fault in the system. If a fault occurs, call your service representative or run the extended diagnostic tests provided with your system.

The following sections provide information for extended testing of the TK50 tape drive on MicroVAX systems equipped with the VAXELN operating system and the MicroVAX Diagnostic Monitor (MDM). The TK50 functional diagnostics run as a level 3 stand-alone program under the MicroVAX II Diagnostic Supervisor.

NOTE

These procedures require extensive knowledge of the MicroVAX Diagnostic Monitor software and should only be carried out by trained service representatives.

The TK50 functional diagnostics program resides in the MicroVAX host processor. The program is responsible for testing the controller module and initializing and reporting results of the level 2 microdiagnostics that reside in the TK50 controller ROMs. The level 2 diagnostics test basic drive functions.

A brief discussion of each of the sequential tests run by the functional diagnostic and the level 2 microdiagnostic programs is included here.

Refer to your systems technical manual for directions and a general discussion of the MicroVAX Diagnostics Monitor and the MicroVAX II Diagnostic Supervisor.

Functional Diagnostics Message Format

The TK50 diagnostic program display messages in the following format.

TK50x - ERROR NUMBER xxx

ERROR DURING EXECUTION OF LEVEL II MICRODIAGNOSTICS

FRU: TK50 CARTRIDGE TAPE DRIVE

*

COMMAND: REPOSITION

UNKNOWN OR UNEXPECTED STATUS RETURNED

STATUS SUBCODE: xxx

RESPONSE FLAGS: xxx

UNIT FAILED - TESTING COMPLETE FOR THIS UNIT

Pass/Fail Criteria

The diagnostics differentiate between soft errors, hard errors, and device fatal errors.

Soft Errors – Soft errors are data or media related and can only occur on data transfer operations. When a soft error occurs, the subsystem's retry mechanism retries the failing data transfer operation. If the retry is not completed successfully, the error is reported as a hard error.

Hard Errors – Hard errors are data, media, or hardware related and only occur when a recovery process is not successful. These diagnostic tests do not distinguish between media related hard errors and hardware faults.

Device Fatal Errors – Device fatal errors are any errors that occur during a nondata transfer operation. The program does not retry these errors.

Both hard errors and device fatal errors report the unit as failed.

Functional Diagnostic Test Descriptions/Verify Mode

The following test descriptions all have the following points in common.

- All errors listed in the test descriptions cause the unit to be dropped from the test.
- Scope loops return to the beginning of the test containing the error, if the operator has chosen to loop-on-error (LOE flag set).

Test 1 – Existence Verification Test – Test 1 verifies the existence of the IP and SA registers by addressing them. An error here could be caused by any of the following.

- An incorrect address setting in the controller DIP switch setting
- Faulty controller logic
- An operator error in specifying a base address or performing the attach command

Test 2 – Level 1 Testing (Power-Up Diagnostics) – Test 2 runs the controller ROM based power-up diagnostics and checks for any errors.

Test 3 – Diagnostic Wrap Test – Test 3 sets the wrap (WR) bit, enters the diagnostic wrap mode, and then writes and reads a floating 1 pattern to and from the SA register. This is repeated with a floating 0 pattern.

A failure to echo the written data results in a callout to the controller. If the LOE flag is set, the program loops on the failing write and read.

Test 4 – Initialization Test – The program disables the interrupts and verifies the following.

- All step transitions occurred within the allotted time
- All host-supplied information is correctly echoed by the controller
- No interrupts occurred as a result of the step transitions
- No interrupts occurred at the vector assigned to the unit

A failure in this test indicates a failing controller.

Test 5 – Vector and BR Level Test – Test 5 repeats Test 4, but with interrupts enabled to test the TK50s vector and BR level. This test verifies that an interrupt occurs at each step transition and insures that the TK50 tape drive cannot interrupt when the CPU priority is set to 7.

An error here could be caused by any of the following.

- An incorrect address setting in the controller DIP switch setting
- Faulty controller logic
- An operator error in performing the attach command

Test 6 – Purge and Poll Test – The host sets the purge and poll (PP) bit and simulates a UQSSP handshake for a bus adapter purge. The host then requests the controller to begin poll testing. The controller initiates DMA activity, in both directions, to the communication area identified by the host. The controller ends this test leaving the communications area cleared.

A failure in this test indicates a failing controller.

Test 7 – Small Ring Buffer Init Test – Test 7 uses the smallest ring buffer and performs the complete initialization without interrupts. Initialization with the smallest ring buffer minimizes the host memory area with which the TK50 controller must be able to communicate. This reduces potential impact on host memory if a failure occurs. The smallest ring buffer is one 32-bit slot.

A failure in this test indicates a failing controller.

Test 8 – Maximum Ring Buffer Test – Test 8 is similar to Test 7, except the program utilizes the maximum allowed ring depth. The ring depth value is equal to 128 command and 128 response slots of 32 bits per slot.

A failure in this test indicates a failing controller.

Test 9 – Get DUST Status Test – Test 9 requests and tests the DUST of each unit for the following conditions.

- No command modifiers set
- Illegal command modifiers set

The program issues the get DUST status command to the unit under test. This command is available in the Diagnostics Utilities Protocol (DUP). The systems tests the DUST status packet received from the unit against a known good mask. If the bits received do not match the mask, the program reports an error.

A failure in this test indicates a faulty controller.

Test 10 – DUP Server Functionality Verification – This test responds to the following DUP commands.

- Send data
- Receive data
- Abort program

The send data and receive data commands operate on the same controller RAM buffer to allow host system wraparound testing of the DUP server communications. The program compares 512 byte blocks of data against the known buffer for data discrepancies.

Functional Diagnostic Test/Service Mode Tests

The level 2 microdiagnostics resident on the TK50 controller, can be called using the DUP protocol. The level 2 microdiagnostics issue no TMSCP commands to the drive during testing.

Test 1 – Q-Bus Exerciser and RAM Test — Test 1 is identical to Test 10 of the level 1 Functional Diagnostics with the following exceptions.

- This test ignores timing constraints.
- This test causes DUP commands to be issued with large time-out values. This compensates for system latency during exerciser tests.

This test exercises the Q-Bus only. It does not test the integrity of the TK50 controller or server firmware.

Test 2 – Execute Level 2 Microdiagnostics – Test 2 performs the following sequence of level 2 microdiagnostic tests twice. This ensures that both channels of the head receive equal testing.

The program runs the entire sequence first at the physical beginning of the tape (BOT) using head channel 1. The tape is then positioned at the physical end of the tape (EOT), and the sequence repeats using head channel 2. At the end of the test, the tape rewinds and is left at the physical BOT of the tape.

Level 2 Microdiagnostic Test Descriptions

The following test descriptions provide a summary of each of the level 2 microdiagnostic tests.

Test 1 – Simple Write/Read Test – Test 1 verifies basic write/read capability.

This test writes several blocks of 1F and 2F data to the tape, rewinds the tape, and reads information back. The program performs a compare operation of the read back function.

Test 2 – Streaming Write/Read Test – Test 2 verifies that the drive can write and read over a fairly long distance while in a normal operational mode.

This test writes various data patterns on a single track and on a set length of tape while the tape is streaming. The tape rewinds and reads while the tape is streaming.

Test 3 – Thrashing Write/Read Test – Test 3 verifies that the tape tracking and tension are not affected by frequent direction changes.

This test writes data patterns on a single track and inserts delays between the write blocks to force thrashing. After rewinding, the program reads the blocks with forced delays between reads.

Test 4 – Peak Shift Test – Test 4 verifies that the write precompensation logic is functioning properly.

This test repeats Test 2 using the worst case MFM peak shift patterns.

Test 5 – Signal Sag Test – Test 5 detects self-erasure of recorded data.

This test writes a set length of tape with blocks of 2F data. The tape rewinds and moves back and forth while stepping the head up and down. The program positions the tape at the logical BOT for the recorded track and reads back.

Test 6 – Overwrite Test – Test 6 guarantees that the drive is capable of overwriting previously recorded data.

The program writes a MW data pattern over a set length of tape on a signal track. The tape rewinds and the program rewrites the data pattern.

Test 7 – Track Access Test – Test 7 verifies tape tracking and the drive's ability to successfully record and retrieve data on adjacent tracks.

The program writes a set number of blocks of data on a signal track. The tape rewinds and steps to the next track. This sequence repeats until all the tracks are written. The test then rewinds the tape and reads back all the blocks from all the tracks.

Test 8 – Positioning Test – The first time through the test sequence, the program positions the tape at the physical EOT of the tape. This lets the entire testing sequence repeat using channel 2 of the head. The second entry into this test causes the tape to be positioned back at the physical BOT of the tape.

This test includes a watchdog timer to guard against a hung drive condition.

REMOVAL AND REPLACEMENT PROCEDURES

The field replaceable units (FRU) associated with the TK50 subsystem are shown in Table 4-5.

Table 4-5 TK50 Subsystem FRUs

FRU	Part Number
2.75 m (9 ft) host-to-subsystem cable	17-00484-01
35.56 cm (14 in) cable with I/O insert	17-01048-01
53.34 cm (21 in) cable with I/O insert	17-01048-02
76.2 cm (30 in) cable with I/O insert	17-01048-03
304.8 cm (120 in) cable with I/O insert	17-01048-04
91.44 cm (36 in) cable with I/O insert	17-01048-05
TK50-A disk drive	TK50-AA
Power supply assembly	30-22561-01
Fan assembly	70-21260-01

Table 4-6 shows the specific enclosure and the TQK50 variations that include the M7546 Q-bus controller module and a cable. The controller accommodates the MSCP Q-Bus. One controller handles one TK50 tape drive.

Table 4-6 TQK50 Cabinet Kit Part Numbers and Descriptions

Part Number	Description
TQK50-AA*	Controller, 76.2 cm (30 in) cable, and BA23 specific access door. Used with a BA23 enclosure.
TQK50-AB†	Controller and 35.56 cm (14 in) cable with I/O panel insert. Used with a BA23 enclosure.
TQK50-BA*	Controller and 76.2 cm (30 in) cable. Used with a BA123 enclosure.
TQK50-BB†	Controller and 53.34 cm (21 in) cable with I/O panel insert. Used with a BA123 enclosure.
TQK50-CB†	Controller and 91.44 cm (36 in) cable with I/O panel insert. Used in cabinet mount BA23 with H3490 I/O panel.
TQK50-PB†	Controller and 76.2 cm (30 in) cable with I/O panel insert. Used in PDP-11/23 PLUS with H349 I/O panel.
TQK50-RB*/†	Controller and 304.8 cm (120 in) cable with bracket to mount I/O panel insert on cabinet rails. Used in non-FCC compliant Q-Bus enclosures with no I/O panel – for field upgrade only.

* Supports a TK50 tape drive installed in the enclosure.

† Supports an external TK50 tape drive installed with the enclosure.

TK50 Tape Drive Removal

NOTE

Repair or replacement of any parts of this subsystem should be carried out only by qualified repair personnel.

To remove the TK50 tape drive from rack mount or desktop subsystems:

1. Set the subsystem power switch to 0 (off).
2. Remove the ac power cable and all other cables from the subsystem.

WARNING

Failure to remove the power cable exposes you to extreme danger. AC power can be present within the chassis, even though the green dc LED is not lit and/or the fan is not turning.

3. Press the quick-release tab on the rear of the rack mount unit and pull the basic chassis from the rack (Figure 4-1).

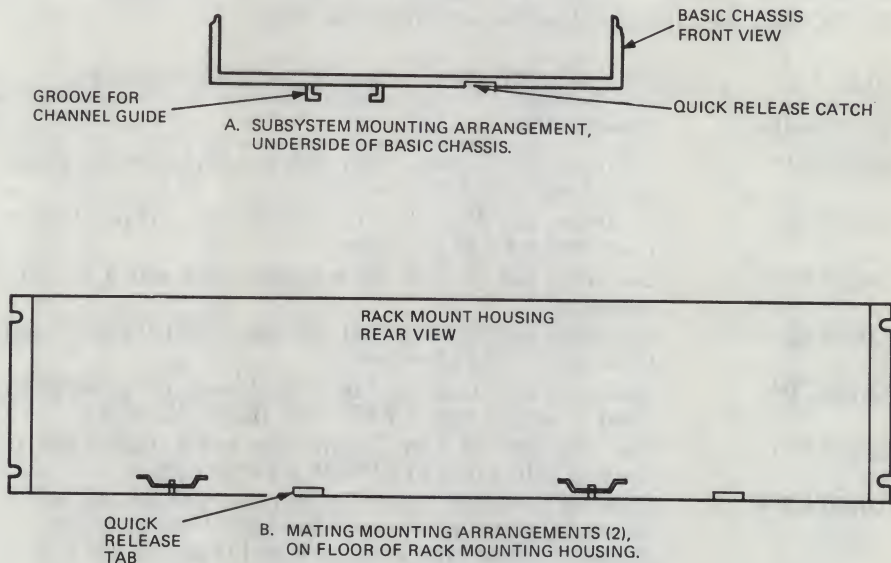


Figure 4-1 Removal from Rack Mount Housing

For the desktop model (TK50-D), remove the rear bezel (three screws) and slide the basic chassis out from the rear of the unit. Use tab located at upper middle of rear panel to pull unit out (Figure 4-2).

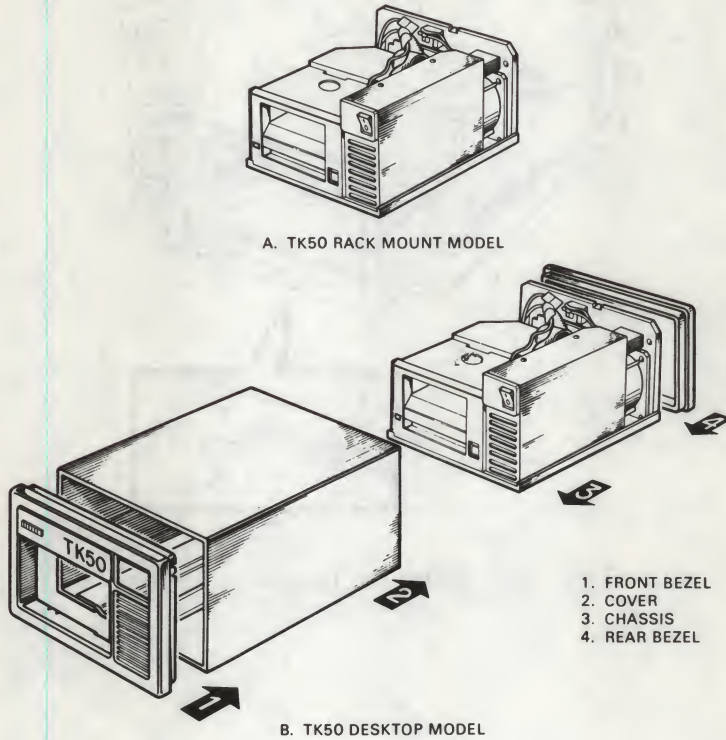


Figure 4-2 Removal from Desktop Housing

4. Press the latch with a pencil and slide the tape drive forward (Figure 4-3).

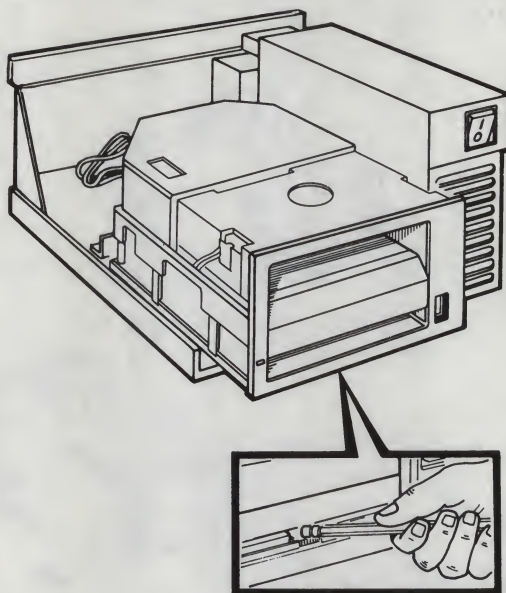


Figure 4-3. Sliding the Tape Drive Forward

5. Unplug the 4-wire power cable from the back of the tape drive (Figure 4-4).
6. Pull the tape drive cable straight out of the back of the tape drive.
7. Slide the tape drive out of the chassis. Use the replacement tape drive's shipping carton to package the drive if it is to be returned.

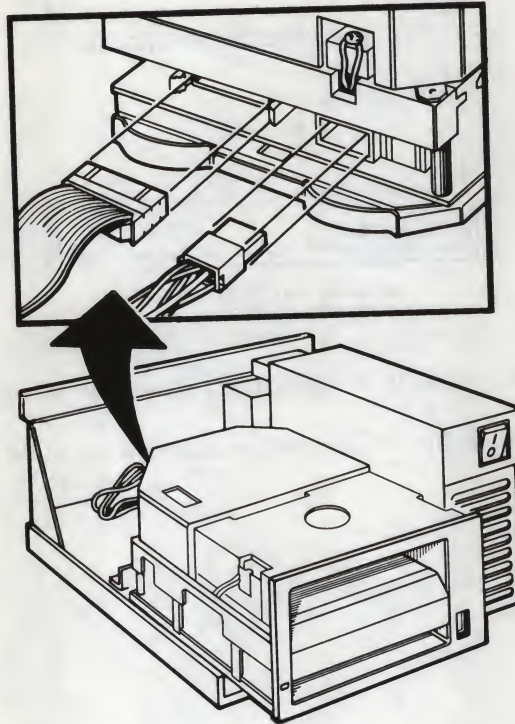


Figure 4-4 Remove the Power Cable and Drive Cables

To install a replacement tape drive:

1. Align the groove on the bottom of the tape drive with the channel guide on the floor of the chassis (Figure 4-5).

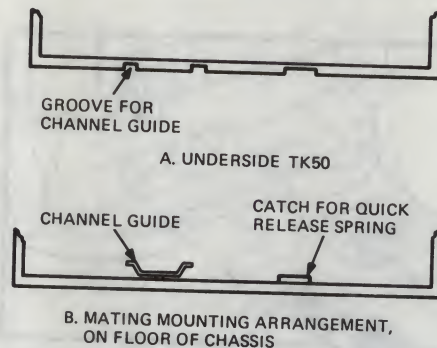


Figure 4-5 TK50-D, -R Subsystem Groove and Channel Guide

Reverse steps 1 through 7 of the removal procedure to install the tape drive.

Power Supply Removal

Use the following procedure to remove the power supply.

NOTE

The power supply is a complete FRU. It is not adjustable and does not contain replaceable printed circuit boards.

1. Remove all cables from the TK50 subsystem.
2. Remove the rear bezel (three screws) and slide the chassis out the rear of the unit.

Remove the front bezel from rack mount units, press the quick release tab, and remove the chassis from the rack.

3. Remove the two screws located on the top plate of the power supply and tip the power supply assembly gently to the right (looking from the front).

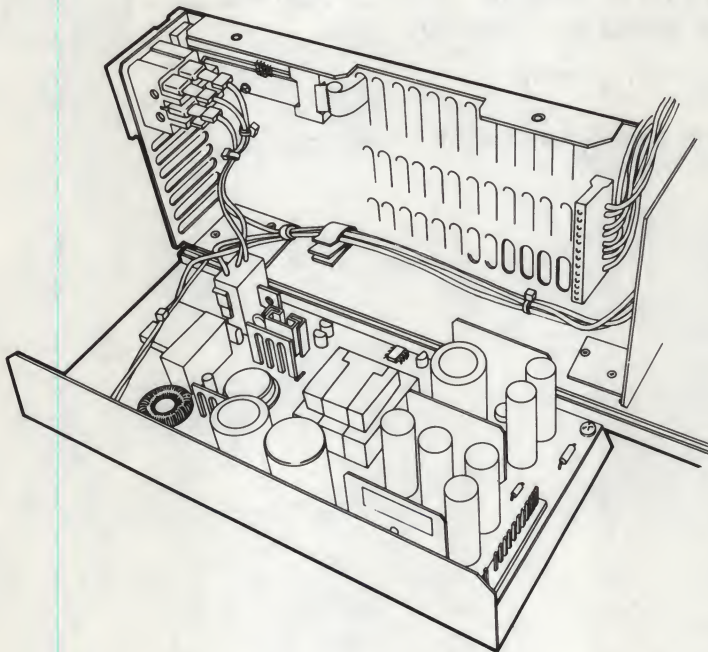


Figure 4-6 Power Supply, Component Side View

4. Disconnect the dc power connector located at the rear of the power supply (Figure 4-6).
5. Lift the power supply assembly out of the chassis.
6. Disconnect the ac power connector located at the lower front of the power supply (Figure 4-6).

Reverse steps 1 through 6 to install a replacement power supply.

Fan Assembly Removal

1. Remove all cable from the TK50 subsystem.
2. Remove the rear bezel (three screws) and slide the chassis out the rear of the unit.

Remove the front bezel from rack mount units, press the quick release tab, and remove the chassis from the rack.

3. Disconnect the dc plug to the fan assembly and remove the four screws on the rear panel holding the fan assembly in place.
4. Remove the fan assembly.

Reverse steps 1 through 4 to install a replacement fan.

Appendix A

Connector Pin Numbers and Signals

Table A-1 shows the J1 signal names and pin numbering.

Table A-1 Connector Signals

Pin Number	Signal Name	Pin Number	Signal Name
J1-01	GROUND	J1-14	DR RD CLK L
J1-02	WRT DATA H	J1-15	DR RD CLK H
J1-03	WRT DATA L	J1-16	GROUND
J1-04	GROUND	J1-17	READ DATA L
J1-05	DR CMD H	J1-18	READ DATA H
J1-06	DR CMD L	J1-19	GROUND
J1-07	GROUND	J1-20	DR STATUS H
J1-08	WRT GATE H	J1-21	DR STATUS L
J1-09	WRT GATE L	J1-22	GROUND
J1-10	GROUND	J1-23	DR WRT CLK H
J1-11	ERASE L	J1-24	DR WRT CLK L
J1-12	ERASE H	J1-25	GROUND
J1-13	GROUND	J1-26	GROUND

Table A-2 AC Power Supply Input Connectors

Pin No.	Signal
1	Ground
2	AC phase
3	AC neutral

Table A-3 DC Power Supply Output Connectors

Pin No.	Signal
1	+5 V
2	+5 V
3	+5 V
4	Return
5	Return
6	Return
7	Return
8	+12 A V
9	+12 A V
10	+12 B V
11	No pin
12	No connection

Appendix B System Specifications

ENVIRONMENT

To receive the best possible performance from the TK50-D, -R subsystem, you must provide the right operating environment, as shown in Table B-1.

Table B-1 General Environmental Requirements

Environment	Operating	Nonoperating
Maximum altitude	2.4 km (8,000 ft)	9.1 km (30,000 ft)
Temperature range*	10°C–40°C (50°F–104°F)	–30°C–66°C (–22°F–151°F)
Relative humidity (noncondensing)	20% to 80%	10% to 90%
Heat dissipation	119 BTU/h (typ.) 148 BTU/h (max.)	

* Reduce the temperature specification by 1.8°C (1°F) for each 1000 m (3,300 ft) increase in altitude.

SUBSYSTEM DIMENSIONS

Height	13.97 cm (5.50 in)
Width	22.86 cm (9 in)
Length	30.58 cm (12 in)
Weight	6.36 kg (14 lb)

TK50 TAPE DRIVE

Performance Specifications

Start distance	12.7 cm (5 in) (min.); 30.5 cm (12 in) (max.)
Stop distance	8.9 cm (3.5 in) (min.); 12.7 cm (5 in) (max.)
Data rate	45 Kbytes/s
Tape speed	75 in/s
Access time from insertion of a new cartridge	1 min (min.); 35 min (max.)

Media Characteristics

Unformatted capacity	132 Mbytes
Recording medium	1.27 cm (1/2 in) wide, 182.88 m (600 ft) long magnetic tape
Recording density	6667 bits per in
Number of tracks	22
Mode of operation	Streaming
Read/Write method	Serpentine
Recording method	Modified Frequency Modulation (MFM)

Physical Specifications

Height	8.25 cm (3.25 in)
Width	14.6 cm (5.75 in)
Depth	20.32 cm (8.00 in)
Weight	2.3 kg (5 lbs)

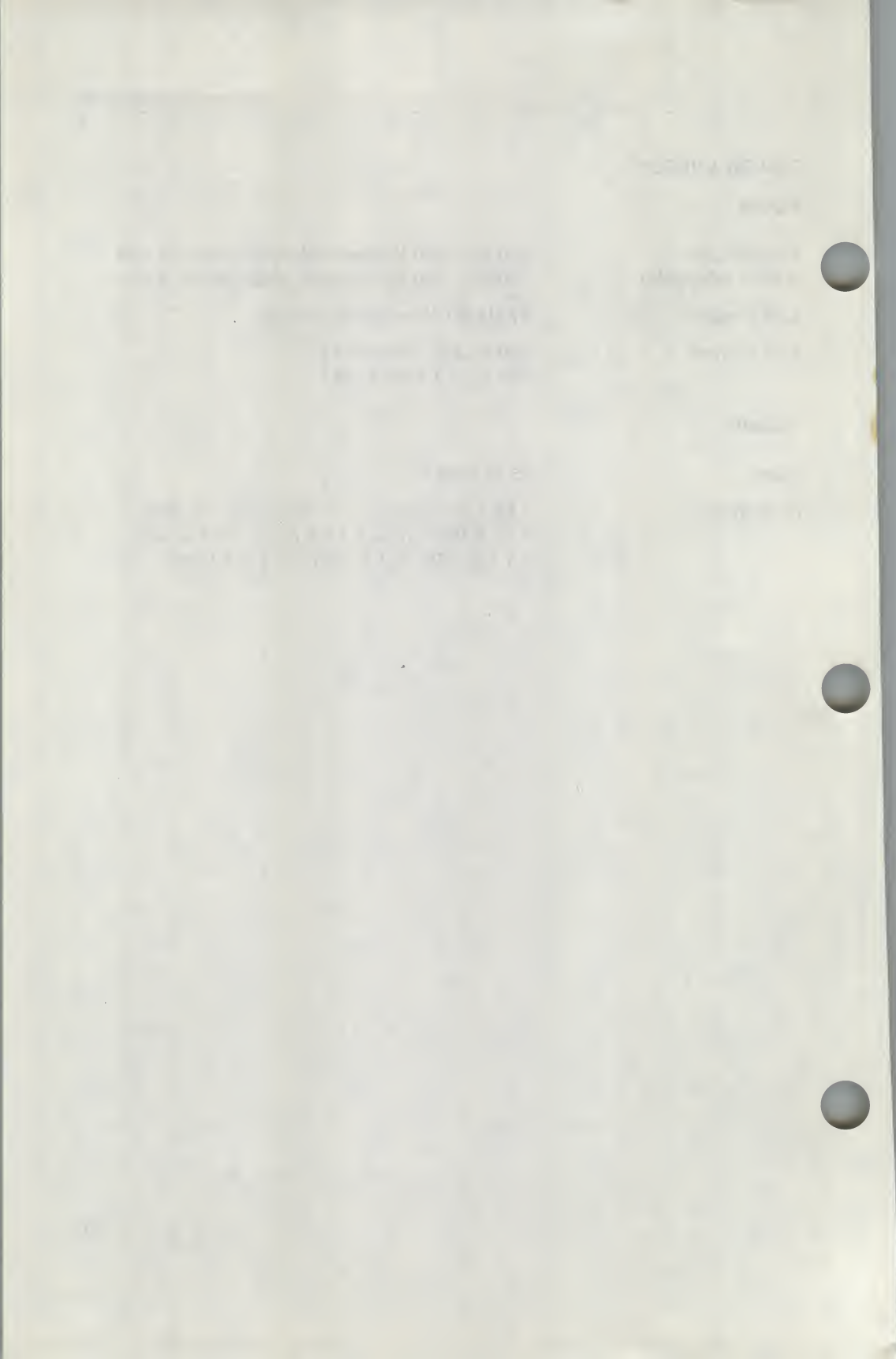
POWER SUPPLY

Inputs

Line voltage (switch selectable)	100 Vac-120 Vac nominal, single phase, 3 wire 200 Vac-240 Vac nominal, single phase, 3 wire
Line frequency	47 Hz-63 Hz either input range
Line current	120 V, 2 A RMS (max.) 240 V, 1 A RMS (max.)

Outputs

Power	65 W (max.)
dc Voltages	+12 A Vdc $\pm 5\%$, 0.1 A (min.) to 4.5 A (max.) +12 B Vdc $\pm 10\%$, 0.12 A (max.) (dc fan only) +5 Vdc $\pm 5\%$, 0.3 A (min.) to 2.0 A (max.)



Appendix C Related Documentation

Table C-1 The TK50 Subsystem Library

Document	Order Number
MicroPDP-11 Systems Owner's Manual*	EK-MIC11-OM
MicroPDP-11 Systems Technical Manual*	EK-MIC11-TM
MicroPDP-11 Systems Owner's Manual†	AZ-FE00A-TC
MicroPDP-11 Systems Technical Manual†	AZ-FE01A-TC
MicroPDP-11 (16-bit) Maintenance Guide	EK-MIC11-SG
MicroVAX II Owner's Manual*	AZ-FE05A-TN
MicroVAX II Technical Manual*	AZ-FE06A-TN
MicroVAX II Owner's Manual†	AZ-FE08A-TN
MicroVAX II Technical Manual†	AZ-FE09A-TN
Mass Storage Tabletop Enclosure (MSTE) Maintenance Guide	EK-LEP05-SG
TK50 Tape Drive Subsystem User's Guide	EK-0TK50-UG
H9302 Rack Mount Kit Installation Guide	EK-LEP03-IN
 The DEC/X11 User's Manual	 AC-F053-MC
The DEC/X11 Cross Reference Manual	AC-F055C-MC
XXDP+/SUPR User's Manual	AC-F348A-MC

* BA23

† BA123

1. The first part of the report deals with the general situation of the country and the progress of the work during the year. It is divided into two main sections: the first section deals with the general situation of the country and the progress of the work during the year, and the second section deals with the specific results of the work.

2. The second part of the report deals with the specific results of the work. It is divided into three main sections: the first section deals with the results of the work in the field of agriculture, the second section deals with the results of the work in the field of industry, and the third section deals with the results of the work in the field of commerce.

3. The third part of the report deals with the conclusions of the work. It is divided into two main sections: the first section deals with the conclusions of the work in the field of agriculture, and the second section deals with the conclusions of the work in the field of industry and commerce.

4. The fourth part of the report deals with the recommendations of the work. It is divided into two main sections: the first section deals with the recommendations of the work in the field of agriculture, and the second section deals with the recommendations of the work in the field of industry and commerce.

Appendix D

Service Options

If you have decided to have Digital Equipment Corporation maintain your system, Digital Field Service offers a flexible range of plans from which you may choose.

ON-SITE SERVICE

This offers the convenience of repair service at your site and the insurance against unplanned and unbudgeted repair costs. For a small monthly cost, you can receive personal service from our service specialists. Usually, within a few hours of your call, a specialist is dispatched to your site with the necessary equipment and spare parts to give your equipment fast, dependable service.

Under basic service, full coverage is available from 8 a.m. to 5 p.m., Monday through Friday. Options are available to extend your coverage to 12-, 16-, or 24-hour coverage and to Saturdays, Sundays, and holidays.

If you require uninterrupted operations, you can choose DECservice, a premium on-site service that guarantees extra-fast response and nonstop remedial maintenance. The representative does not leave until the problem is solved.

Under basic service and DECservice, all parts, materials, and labor are covered in full.

CARRY-IN SERVICE

This is offered to customers who don't need the convenience of on-site coverage, but do require the same fast, personal response and the ability to plan their maintenance expenditures, at a lesser monthly cost than on-site service.

When a unit is brought to one of the 160 Digital Service Centers worldwide, you can be sure that your unit will receive expert repair service from factory-trained personnel. Your unit is guaranteed to be repaired within two days, normally within 24 hours. Carry-in service is available on selected terminals and systems. Contact your local Digital Field Service Office to determine if this service is available for your unit.

DECmailer

This is our service for users who have technical resources to perform the first line of maintenance themselves. DECmailer customers can troubleshoot, identify, and isolate component(s) that caused the problem and mail it to our Customer Returns Center. Here, the module receives expert repair and is return-mailed back to you within five days. With DECmailer service, you are charged for each use, rather than a monthly rate.

PER CALL SERVICE

This is for users who wish to establish a maintenance program on a noncontractual, time, and materials cost basis. It is available with either on-site or carry-in service, and is appropriate for users who have sufficient expertise to perform first-line maintenance, but may occasionally need greater support from Field Service.

PER CALL

This is also offered as a supplementary program for Basic Service Plan Customers who require remedial maintenance outside their contracted hours of coverage; in that case, however, there is no charge for materials.

ON-SITE PER CALL SERVICE

This is provided on a best-effort basis, with a normal response time of two to three days. It is available 24 hours a day, seven days a week.

CARRY-IN PER CALL SERVICE

Service is available during normal business hours, with a turn-around time of two to three days.

For additional information about these Digital Service Plans, their prices, and special rates for volume customers, contact your local Digital Field Service Office. Call one of the information numbers for the location of the Digital Field Service Office nearest you.

DIGITAL INTERNATIONAL FIELD SERVICE INFORMATION NUMBERS

U.S.A.	1-800-554-3333
Canada	(800) 267-5251
United Kingdom	(734) 868711
Belgium	(02) 2425095
West Germany	(089) 95910
Italy	(02) 617961
Japan	(03) 989-7161
France	(6) 0778292
Denmark	(2) 889666
Spain	(1) 7331900
Finland	(0) 423511
Holland	(30) 640293
Switzerland	(01) 8169111
Sweden	(8) 7338000
Norway	(2) 160290
Austria	(222) 6776410
Ireland	(1) 308433
Portugal	(1) 725402
Australia	(02) 4125555



Index

AC connector, power supply, 4-30

Acronyms, list of, vi

Address

controller module, 1-9, 3-13

factory setting, 3-4

floating, 3-14

Address/vector worksheet, 3-14

Backplane

arrangements, 3-10

available space, 3-2, 3-10-3-11

module installation rules, 1-10, 3-10

slots, 3-10

Backup

guidelines, 2-7

storage, 3-3

Basic function test, 4-15

Bezel, 1-3, 3-3, 4-25

Cable

4-wire power, 4-27

controller, 1-15

I/O distribution panel, 1-16, 1-18

installation, 1-13, 1-15-1-16, 1-18

options, 3-19

part numbers, 3-19, 4-23

power, 1-19, 4-27

Care and handling, tape, 2-7

Cartridge release handle

caution, 2-10

function, 2-3

troubleshooting, 4-3

using, 2-8, 3-7

Cassette. *See* tape cartridge

Caution

cartridge release handle, 2-10

indicator light, 2-9

static, iv, 1-1, 1-5, 1-8

voltage, 1-19

Chassis description, 3-3

Checklist, troubleshooting table,
4-2-4-3

Circuit breaker, 2-4, 3-5, 3-8

Command error reporting, 4-12

Complex read/write test, 4-16

Config, software program, 1-24

Configuration

address, 3-14

controller module, 1-9, 3-4
3-13-3-15

diagram, 3-20, 3-21, 3-23

discussion, 3-9-3-18

expansion space, table, 3-12

floating addresses chart, 3-15

MicroPDP-11 example, 3-20-3-21

MicroVAX example, 3-20-3-21

module priority table, 1-11, 3-12

- operating system, 1-24
- PDP-11/23 PLUS, 3-22
- power requirement, 3-10
- revision level switch, 3-18
- rules, 3-9-3-12
- unit number switch, 3-17
- worksheets, 3-11, 3-14, 3-25
- Connecting a TK50 subsystem, 1-18
- Connector
 - J1 interface, 1-18, 3-8
 - J1 pin signal and number, A-1
 - power supply signal and number, A-2
 - rear panel, 2-4
- Controller. *See also* controller module
 - jumper setting, 3-4
 - kit options, 3-19, 4-24
 - revision level switch, 3-4
 - testing, 4-18-4-23
 - troubleshooting, 4-4
 - unit number switch, 3-3
- Controller errors, 4-7
- Controller module
 - configuration, 1-9
 - part number, 3-2, 3-19, 4-24
 - quick-test, 1-12
 - starting address, 3-13
- Controls
 - front panel, 2-2-2-3, 3-6
 - table, 2-3
 - Controls. *See* indicator, switch
- Cover removal, 1-5, 1-17
- CSR address, 3-4
- CZTKA tests
 - description, 4-7, 4-9
 - execute mode, 4-4, 4-8-4-9
 - functional diagnostics 4-5
 - hardware questions, 4-5
 - message format 1, 4-6
 - message format 2, 4-7
 - software questions, 4-6
- user interface, 4-5-4-7
- verify mode 4-4, 4-7
- XXDP+, 4-6
- CZTKB tests
 - command errors, 4-12
 - data reliability, 4-10-4-16
 - description, 4-15-4-16
 - drive error table, 4-13
 - error reporting, 4-12
 - hard error reporting, 4-14
 - hardware questions, 4-10
 - log packet errors, 4-12
 - program errors, 4-12
 - soft error reporting, 4-15
 - software questions, 4-11
 - status errors, 4-12
 - user interface, 4-10
 - using, 4-10
- Data reliability test. *See* CZTKB tests
- DC connector, power supply, 4-30
- Device fatal errors, 4-18
- Device starting address, 3-4
- Diagnostics. *See also* diagnostics
 - level 1, diagnostics level 2,
 - CZTKA tests, CZTKB tests
 - command errors, 4-12
 - device fatal errors, 4-18
 - drive error table, 4-13
 - error reporting, 4-12-4-18
 - hard error, 4-14, 4-18
 - hardware questions, 4-5
 - log packet errors, 4-12
 - message format, 4-12, 4-15
 - MicroPDP-11, 4-4-4-17
 - MicroVAX, 4-17-4-23
 - pass/fail criteria, 4-18
 - service mode, 4-21-4-22
 - soft error, 4-15, 4-18
 - software questions, 4-6

- test description, 4-7-4-10
4-18-4-23
- verify mode, 4-7, 4-18
- XXDP+, 4-4
- Diagnostics level 1
 - CZTKA message format, 1, 4-6
 - CZTKA user interface, 4-5-4-7
 - CZTKA verify mode, 4-4
 - execute level 2 tests, 4-21
 - hardware questions, 4-5
 - software questions, 4-6
 - test description, 4-7
 - verify mode, 4-7, 4-18
- Diagnostics level 2
 - CZTKA execute mode, 4-4
 - CZTKA message format 2, 4-7
 - CZTKB data reliability test, 4-4
 - execute level 2 microdiagnostics, 4-21
 - execute mode, 4-8-4-9
 - service mode, 4-21-4-23
 - test descriptions, 4-8-4-9, 4-21-4-22
- Digital storage architecture, 3-5
- Diskette
 - handling, 1-21
 - label, 1-21
 - testing with, 1-21
 - user test, 1-20
- Document references, C-1
- Drive error reporting, 4-13-4-15
- DRV SEL signal, 3-8
- DUP server functionality test, 4-20
- Environment
 - tapes, 2-7
 - requirements, 3-5
 - specifications, B-1
 - temperature, 3-5
- Error reporting, 4-12-4-15, 4-18
- Execute level 2 diagnostics, 4-21
- Execute mode
 - discussion, 4-8-4-9
 - test descriptions, 4-8-4-9
- Existence verification test, 4-7, 4-18
- Expansion space
 - discussion, 3-10
 - table, 3-12
- Extended testing. *See also* diagnostics
 - MicroPDP-11, 4-4-4-17
 - MicroVAX, 4-17-4-23
- Fan
 - description, 3-5
 - FRU procedure, 4-30
 - part numbers, 4-23
- Field replaceable unit. *See* FRU
- Floating address/vector
 - configuration chart, 3-15
 - list of module priority, 3-16
 - worksheet, 3-14
- Front panel
 - controls and indicators, 2-3
 - description, 3-6
- FRU
 - fan, 4-30
 - part numbers, 4-23
 - power supply, 4-29
 - procedures, 4-24-4-30
 - TK50, 4-24-4-28
 - TK50 installation, 4-28
- Functional faults. *See* data reliability
- Get DUST status test, 4-20
- Grant continuity card, 3-9, 3-10
- Ground straps, 1-7, 1-16

- Handling tapes, 2-7
- Handle. *See* cartridge release handle
- Hard error reporting, 4-14
- Hardware questions, 4-10
- Help
 - service representative, vi
 - telephone numbers, D-3
 - troubleshooting, vi
- I/O distribution panel
 - available space, 3-2
 - cable installation, 1-13, 1-18
 - I/O insert panel, 1-13, 3-12
 - installation, 1-13
 - removal, 1-7
- Illegal device name, 4-3
- Indicator
 - caution, 2-9
 - load/unload, 2-8
 - front panel, 3-6
 - sequence, 3-7
 - table, 2-3
 - troubleshooting, 4-3
- Initialization test, 4-19
- Installation
 - controller cable, 1-15
 - controller module, 1-10, 1-14
 - grant continuity card, 3-9
 - I/O distribution panel, 1-13
 - parts needed, 1-2, 1-4-1-5
 - procedures, 1-1-1-20
 - testing, 1-21-1-24
- Interrupt vector, 3-13
- J1 connector signal and number, A-1
- Jumper setting, 1-9, 3-4, 3-13
- Label
 - device name, 3-8
 - tape cartridge, 2-6
- LED. *See also* indicators
 - diagnostic, 1-12
 - front panel, 2-3, 3-6
 - location, 1-12
 - quick test, 1-12
 - sequence on front panel, 3-7
- Library, C-1
- Light emitting diode. *See* LED
- Lights on the control panel, 2-3
- Loading a tape, 1-22, 2-8
- Load/unload switch, 2-3, 3-6
- Log packet error reporting, 4-12
- Mass storage control protocol, 3-5
- Maximum ring buffer test, 4-20
- MDM, 4-17
- Media characteristics, B-2
- Media interchange test, 4-16
- Message
 - diagnostic test format, 4-6-4-7
 - hard error, 4-14
 - illegal device name, 4-3
 - MicroVAX format, 4-17
 - read error, 4-3
 - soft error, 4-15
 - successful test, 1-21
 - write error, 4-3
- MicroPDP-11. *See also* diagnostics
 - backplane configuration, 3-10
 - configuration example, 3-20-3-21
 - controller/cable option, 3-19
 - testing, 4-4-4-16
 - TK50 installed (one), 3-20
- MicroVAX. *See also* diagnostics
 - backplane configuration, 3-10
 - configuration example, 3-20-3-21
 - controller/cable option, 3-19
 - diagnostic monitor, 4-17
 - test descriptions, 4-21-4-22

- testing, 4-17-4-22
- software, 3-5
- TK50 installed (one), 3-20-3-21
- MicroVMS, 3-5
- Mode
 - execute, 4-4, 4-8-4-9
 - service, 4-21-4-22
 - verify mode, 4-4, 4-18
- Module
 - address, 3-13-3-15
 - controller (M7546), 3-2, 3-3-3-4
 - installation, 1-10-1-14
 - LED location, 1-12
 - location of CPU, memory, 3-9
 - preparation, 1-9
 - priority 1-10-1-11, 3-9
 - removal, 1-8
 - unit number designation, 3-8
- MSCP, 3-5
- MU0 tape unit number, 3-8
- MUA0 tape unit number, 3-8
- Operating
 - features, 3-5
 - system, 1-24
 - TK50, 2-1-2-9
- Options, controller kit, 3-19, 4-24
- Overwrite test, 4-9, 4-22
- Pass/fail criteria, 4-18
- PDP-11 software, 3-5
- PDP-11/23 PLUS
 - backplane, 3-10
 - configuration examples, 3-22
 - controller kit, 3-19, 4-24
 - I/O distribution panel, 3-22
 - power controller, 1-20
 - TK50 installed (one), 3-23
 - TK50 installed (two), 3-24
- Peak shift test, 4-9, 4-22
- Placement guidelines, 1-1
- Positioning test, 4-9, 4-22
- Power requirements, 3-10-3-11
- Power supply
 - connectors, 4-30
 - pin numbers, A-2
 - current drawn, 3-11
 - description, 3-5
 - FRU procedure, 4-29-4-30
 - part number, 4-23
 - regulator, 3-5
 - signal names, A-2
 - specifications, B-3
- Power-up diagnostics, 4-18
- Priority, table, 1-11
- Program error reporting, 4-12
- Purge and poll test, 4-19
- Q-Bus exerciser and RAM test, 4-21
- Quick release latch, 4-24, 4-26
- Quick verify read/write test, 4-15
- Rack mount, 1-2-1-3, 4-25
- Read error message, 4-3
- Read unknown tape, 4-16
- Ready button, 1-22
- Rear panel, 2-4, 3-8
- Regulator, 3-5
- Removing a tape, 2-10
- Revision level switch, 1-9, 3-4, 3-18
- Rewinding a tape, 2-10
- Service mode tests, 4-21-4-22
 - See also* diagnostics level 2
- Service options, D-1-D-3
- Signal sag test, 4-9, 4-22
- Simple write/read test, 4-8, 4-21
- Small ring buffer init test, 4-20
- Soft error reporting, 4-15

Software

- diagnostic, 4-4
- MicroVAX systems, 4-17
- questions, 4-11
- supported, 3-5

Specifications

- environment, B-1
- power supply, B-3
- TK50, B-2

Starting address

- additional TK50, 3-15-3-16
- worksheet, 3-14

Static

- caution, v, 1-1, 1-5, 1-8
- wrist strap, v, 1-8

Status error reporting, 4-12

Streaming write/read test, 4-8, 4-22

Subsystem features, 3-2-3-4

Switch settings

- load/unload, 2-3, 2-8, 3-6
- on/off, 2-3
- power supply, 3-5
- revision level, 1-9, 3-4, 3-18
- unit number, 1-9, 3-3, 3-17
- voltage, 1-19, 2-4
- write-protect, 2-6

SYSGEN software program, 1-24

Tape. *See* tape cartridge

Tape cartridge

- calibration, 2-8
- care and handling, 2-7
- description, 3-3
- inserting, 1-22, 2-5
- labeling, 2-6
- load-in drive, 2-8
- recording, 2-5
- removing, 1-22, 2-10
- rewind, 2-10
- storage, 2-5
- testing with, 1-22

troubleshooting, 4-3

- unload, 2-10
- user test, 1-20
- using, 1-22, 2-5
- write-protect, 2-6

Tape drive

- indicator lights, 2-8
- parts of, 2-5
- troubleshooting, 4-8-4-9
- 4-21-4-22

Telephone numbers for help, D-3

Testing. *See also* diagnostics

- message, 1-21
- with diskette, 1-21
- with tape, 1-22

Thrashing write/read test, 4-8, 4-22

TK50 (TK50-D, -R). *See also* TQK50

- controller, diagnostics, FRU
- bezel, 4-25
- cabinet kits, table, 4-23
- connector J1, 1-18
- controls, 2-3
- dimensions, B-1-B-2
- FRU procedures, 4-23-4-30
- guidelines, 1-1
- installation, 1-2, 1-4, 4-28
- MicroPDP-11 testing, 4-4-4-16
- MicroVAX testing, 4-17-4-23
- number to add on, 3-2
- operation, 2-1-2-10
- part numbers, 3-3, 4-24
- parts, 2-5
- physical features, 3-2-3-4
- removal, 4-24-4-28
- specifications, B-2
- troubleshooting, 4-2

TQK50 controller. *See also* controller module

- cabinet kit part numbers, 4-24
- description, 3-3-3-4

Track access test, 4-9, 4-22

Troubleshooting. *See also* diagnostics

- basic checklist, 4-2-4-3
- boot/diagnostic ROM, 4-1
- controller, 4-4
- correction of a problem, 4-2
- general description, 4-1
- tape drive, 4-8-4-16
- user test, 4-1

Unit number

- designation, 3-8
- switch setting, 1-9, 3-17
- table, 3-17

User interface

- command errors, 4-12
- data reliability testing, 4-10-4-16
- device fatal errors, 4-18
- discussion 4-5-4-7
- error reporting, 4-12
- hard errors, 4-14, 4-18
- hardware questions, 4-10
- log packet errors, 4-12
- message format, 4-6-4-7, 4-17
- soft errors, 4-18
- status errors, 4-12

User test diskette, 1-20-1-21**User test tape, 1-20, 1-22****Using the TK50 tape drive, 2-8****Vdc from power supply, 3-5****Vector, floating, 3-14****Vector and BR level test, 4-19****Verify mode**

- MicroPDP-11 tests, 4-7
- MicroVAX tests, 4-18-4-23
- test descriptions, 4-7

VOLT SEL, power supply, 3-5**Voltage**

- discussion, 3-3
- switch, 1-19, 2-4
- warning, iv, 1-12, 4-24

Wrap test, 4-19**Wrist strap, part number, 1-8****Write error message, 4-3****Write interchange tape, 4-16****Write-protect**

- fixed disk drive, 2-7
- switch, 2-6
- tape cartridge, 2-6

XXDP+ supervisor

- See* CZTKA test

- See* CZTKB test

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CONFIGURATION WORKSHEET

ADD THESE COLUMNS

BACKPLANE SLOT	MODULE	CURRENT (AMPS)		POWER (WATTS)	I/O PANEL INSERTS	
		+5 V	+12 V		B (2 x 3)	A (1 x 4)
1 AB CD						
2 AB CD						
3 AB CD						
4 AB CD						
5 AB CD						
6 AB CD						
7 AB CD						
8 AB CD						
MASS STORAGE 1 2						

TOTAL THESE
COLUMNS:

MUST NOT
EXCEED:

36.0

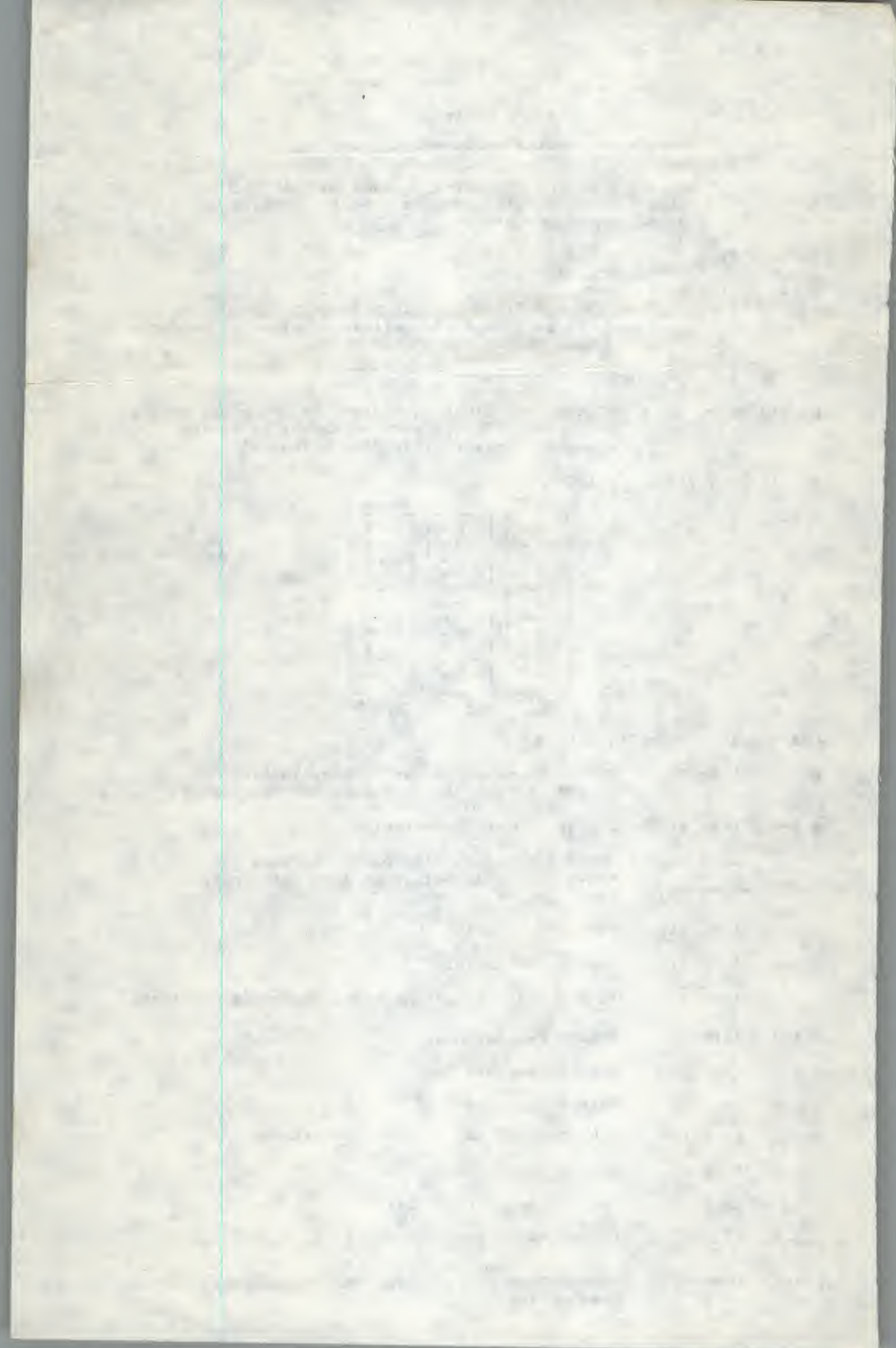
7.0

230

4

2*

* IF MORE THAN TWO TYPE A FILTER CONNECTORS ARE REQUIRED, AN ADAPTER TEMPLATE (PN 74-27740-01) MAY BE USED. THIS WILL ALLOW THREE ADDITIONAL TYPE A FILTER CONNECTORS, BUT WILL REDUCE THE AVAILABLE TYPE B CUTOUTS TO TWO.



ERRATA SHEET

TK50 TAPE DRIVE SUBSYSTEM OWNER'S MANUAL

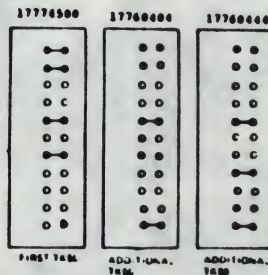
Please make the following changes to the TK50 Tape Drive Subsystem Owner's Manual (document number EK-LEP05-OM-001).

INTRODUCTION

- p ix Line 18 : Add
 . Do NOT Place foreign objects inside drive.
 . Always remove the cartridge before powering-down and/or moving the drive.

CHAPTER 3 Technical Description

- p 3-13 Line 16: DELETE "The floating address of the M7546 Module starts at 17760404 and increments by 4; for example 17760404, 17760410, 17760414".
- p 3-15 Fig 3-7 CHANGE



CHAPTER 4 Troubleshooting

- p 4-4 Line 4: CHANGE "host processor" to controller.
 DELETE the next two lines in that paragraph.
- p 4-5 Line 9: DELETE "NO is the default".
- Line 16: REPLACE complete line with: "Prompts for additional information on each unit under test".
- Line 21: CHANGE (0) to (X).
- p 4-6 Line 2: CHANGE (0) to (X).
- Line 8: DELETE Both paragraphs under "Software Questions".
- p 4-7 Line 22: DELETE rest of page.
- p 4-8 DELETE complete page.
- p 4-9 DELETE complete page.
- p 4-12 Line 12: DELETE first two lines in paragraph.
- Line 20: DELETE "NO is the default".
- Line 26: CHANGE "TKIP" to TK IP.
- p 4-13 Line 7: CHANGE "MUO. MU1 to 0, 1, 2, 3.
- p 4-23 Line 7: CHANGE "Microdiagnostics" to Functional Diagnostics.

fig. 1-1, MR-15369; fig. 1-2, MR-15350; fig. 1-3, MR-15370; fig. 1-4, MR-15366; fig. 1-5, MR-13091; fig. 1-6, MR-15358; fig. 1-7, MR-15349; fig. 1-8, MR-15295; fig. 1-9, MR-15347; fig. 1-10, MR-15345; fig. 1-11, MR-15364; fig. 1-12, MR-15346; fig. 1-13, MR-15344; fig. 1-14, MR-13052; fig. 1-15, MR-15342; fig. 1-16, MR-15367; fig. 1-17, MR-15359; fig. 1-18, MR-15341; fig. 1-19, MR-15372; fig. 1-20, MR-13472; fig. 2-1, MR-15351; fig. 2-2, MR-15510; fig. 2-3, MR-15371; fig. 2-4, MR-15368; fig. 2-5, MR-15372; fig. 3-1, MR-15360; fig. 3-2, MR-15361; fig. 3-3, MR-15351; fig. 3-4, MR-15510; fig. 3-5, MR-15340; fig. 3-6, MR-15964; fig. 3-7, MR-15337; fig. 3-8, MR-15354; fig. 3-9, MR-15352; fig. 3-10, MR-15353; fig. 3-11, MR-15355; fig. 3-12, MR-15339; fig. 3-13, MR-15357; fig. 3-14, MR-15356; fig. 4-1, MR-14740; fig. 4-2, MR-15360; fig. 4-3, MR-15362; fig. 4-4, MR-15365; fig. 4-5, MR-15373; fig. 4-6, MR-12186

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